DRAFT

RECIRCULATED
ENVIRONMENTAL IMPACT REPORT

Trail Change in Use and Improvement Project
Samuel P. Taylor State Park

September 2011

Lead Agency

State of California
DEPARTMENT OF PARKS AND RECREATION
Acquisition and Development
One Capitol Mall - Suite 410
Sacramento, California 95814

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Acronyms and Abbreviations

ADA	Americans with Disabilities Act
BMPs	Best Management Practices
CA	California
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CNDDB	California Natural Diversity Database (Calif. Dept. of Fish and Game)
CRWQCB	California Regional Water Quality Control Board
Dbh	Diameter at Breast Height
DEIR	Draft Environmental Impact Report
DFG	California Department of Fish and Game
DPR	California Department of Parks and Recreation
EIR	Environmental Impact Report
ft	feet
NOC	Notice of Completion
NOI	Notice of Intent
NOP	Notice of Preparation
OPR/SCH	Office of Planning and Research / State Clearinghouse
PRC	Public Resources Code
RDEIR	Recirculated Draft Environmental Impact Report
RWQCB	Regional Water Quality Control Board
SOD	Sudden Oak Death
SP	State Park
SPTSP	Samuel P. Taylor State Park
sq	square
SRA	State Recreation Area
U.S.	United States
USFS	United States Forestry Service
USFWS	United States Fish and Wildlife Service

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Trails Glossary

Whenever the following terms are used, the intent and meaning will be interpreted as follows:

Armored Crossing - A dip the trail grade aligned with a natural drainage that the trail has intersected and lined with large flat topped rock to create a sustainable surface during periods when the drainage caries water.
Back Slope – The bank along the uphill side of the trail usually sloped back a varying degree, depending on bank composition and slope stability.
Berm – The ridge of material formed on the outer edge of the trail that projects higher than the center of the trail tread.
Bridge – A structure, including supports, erected over a depression or stream and having a deck for carrying traffic.
Brushing – Removal of living and dead vegetation from a trail.
Classification – The designation indicating intended use and maintenance specifications for a particular use.
Clearing Limits – The outer edges or a clearing area as specified by trail class, shown on drawings or explained in class definition.
Compacted - The degree of consolidation that is obtained by tamping with hand tools or by stomping mineral soil and small aggregate in successive layers not more than 6 inches in depth.
Cribbing structures - Timbers or logs structures constructed over minor drainage crossings.
Culvert – A drainage structure composed of rock, metal or wood that is placed approximately perpendicular to and under the trail.
Drainage Dip – A reverse in the grade of the trail bed accompanied by outslope that will divert water off the rail bed.
Duff – A layer of decaying organic plant materials deposited on the surface of the ground principally comprised of leaves, needles, woody debris and humus.
Entrenched Trail – Cupping, rutting or trenching in the trail tread surface resulting from trampling, standing water, uncontrolled surface runoff or a combination of these factors.
Fill-Slope – Area of excavated material cast on the down slope side of trail cut (also called embankment).
Ford – A water level stream crossing constructed to provide a level surface for safe traffic passage.
Full bench – Where the total width of the trail bed is excavated into slope and the trail bed width is not made of compacted fill-slope.
Hazardous Tree – An unstable tree, 5 inches or greater in diameter at breast height, that is likely to fall across the trail.
Incised Drainages – Drainages that are deeply and sharply cut into the landscape.
Inslope – Where the trail bed is sloped downward toward the backslope of the trail.
Mineral Soil – Soil or aggregate that is free from organic substance and contains no particles larger than 2 inches in greatest dimension.
Outslope – The trail bed is sloped downward toward the embankment or daylight side of the trail.

Physiography - A description of the features and phenomena of nature
Pinch Point - A trail speed-control measure constructed of logs or boulders protruding onto the trail from each side creating the need to travel an "S" path to negotiate through.
Puncheon – A log or timber structure built to cross a swamp. Usually consists of sills, stringers and a log deck.
Retaining or Crib Wall – A log or rock construction to support trail tread or retain backslope.
Sideslope – The natural slope of the ground measured at right angles to the center line of the trail.
Single Track – A trail so narrow that users must general travel in single file.
Slide – Material that has slid onto the trailway from the back slope and possibly beyond in quantities sufficient to block the trail.
Slough (sluff) – The materials from the back slope or the area of the back slope that has been deposited on the trail bed and projects higher that the center of the trail.
Slump – When the trail bed material has moved downward causing a dip in the trail grade.
Specifications – Standards to which trails and trail structures are built and maintained according to class.
Sustainable Trail –A trail that supports current and future use with minimal impact to the area's natural systems; produces negligible soil loss or movement while allowing vegetation to inhabit the area; recognizes that pruning or removal of certain plants may be necessary for proper maintenance; does not adversely affect the area's animal life; accommodates existing use while allowing only appropriate future use, and; requires little rerouting and minimal long term maintenance.
Switchback – A turn that is constructed on a slope of more than 30 percent when measured between the exterior boundaries of the trail 120 -180 degrees. The landing is the turning portion of the switchback. The approaches are the 20 foot trail sections upgrade and downgrade from the landing.
Technical Trail Feature (TTF) – An obstacle on the trail requiring negotiation; the feature can be either built or natural, such as an elevated bridge or rock face.
Temporally – Lasting only a short time.
Trail Bed – The portion of trailway between the hinge point of the back slope and the hinge point of the fill-slope.
Trail Hardening – The manual, mechanical or chemical compaction/firming of the trail tread surface resulting in a hard and flat surface that sheets water effectively and resists the indentations that are created by trampling.
Trail Log – An inventory of physical features along or adjacent to a trail. An item by item footage record of trail features and facilities or improvements on a specific trail.
Travel Way or Corridor – Includes tread surface and clearing limits.
Turnpike – tread made stable by raising trail bed above wet, boggy areas by placing mineral soil between parallel side logs. Usually includes ditches alongside the road.
Water Bar – A device used for turning water off the trail, usually made of logs or stones.
Water Course – Any natural or constructed channel where water will collect and flow.

1.0 BACKGROUND AND PURPOSE OF THE RECIRCULATED DRAFT ENVIRONMENTAL IMPACT REPORT

In April 2011, the California Department of Parks and Recreation (DPR) released the Trail Change in Use and Improvement Project at Samuel P. Taylor State Park (SPTSP) Draft Environmental Impact Report (DEIR), which assessed the potential environmental impacts of implementing the proposed change in use to Bill's Trail. The proposed project would convert the trail from a duel use to multiuse, allowing mountain bikes on the trail.

The DEIR was circulated for public review and comment for a period of 45 days that ended on June 1, 2011. At the request of several stakeholders, the review period was extended to July 11, 2011. By the end of the review period, numerous comments were received on the environmental impact report (EIR). DPR reviewed those comments to identify specific environmental concerns and determine whether any additional environmental analysis would be required to respond to issues raised in the comments. Several issues were raised that DPR deemed significant enough to warrant additional discussion and mitigation.

Section 15088.5 of the California Environmental Quality Act Guidelines (State CEQA Guidelines) requires lead agencies to recirculate an EIR when significant new information is presented, after public notice is given of the availability of the DEIR for review. Significant new information requiring recirculation includes a disclosure showing that "changes to the project or environmental setting" or "a new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented." Section 15088.5 requires recirculation of only the significant new information, rather than the entire DEIR. Therefore, DPR has decided to recirculate these sections of the DEIR for public review.

As required by Section 15088 of the State CEQA Guidelines, DPR will evaluate and respond to all comments that have been received on the DEIR and new comments provided on the sections included in the recirculated DEIR (RDEIR). All comments and responses will be included in the final EIR (FEIR).

1.1 Content of the RDEIR

Consistent with the requirements of Section 15088.5(c) of the State CEQA Guidelines, this RDEIR contains only those sections of the DEIR in which significant new information is provided (e.g., Aesthetics, Biology, Hydrology, and Transportation). This information is considered significant new information based on Section 15088.5(a) of the State CEQA Guidelines; therefore, DPR is providing this information to the public for its review as part of this RDEIR.

The RDEIR consists of the following chapters and sections. All chapter and section numbering is consistent with the chapter and section numbering outline in the DEIR (released July 2006).

Chapter 1, “Introduction”: Chapter 1 describes the purpose and organization of the RDEIR.

Chapter 2, “Project Description”: Chapter 2 describes the project location, background, proposed actions by DPR, lead agency, trustee and responsible agency actions, project characteristics, and project objectives. This chapter also describes project construction and regulatory requirements. It has been updated and revamped as necessary to provide a more comprehensive background of the project, DPR policies and mountain biking generally.

Chapter 4.1, Aesthetics/Visual Resources: This chapter is revised to include new information related to DPR policies as well as the operational impacts on the existing visual character and quality of the site and surroundings in light of these policies. A mitigation measure has been added to address resource protection, including scenic resources and sense of place.

Chapter 4.3, Biological Resources: This chapter is revised to evaluate operational impacts on terrestrial species. Additionally, discussion of impacts to the movement of resident or migratory species was inadvertently omitted in the Draft EIR and discussion of that threshold has been incorporated herein. Although this new threshold is added, it does not result in a new significant impact.

Chapter 4.8, Hydrology/Water Quality: This chapter is revised to consider the sedimentation impacts from expanded uses based on the Clearwater Hydrology Report. Additional project requirements have been incorporated to insure that sedimentation impacts remain less than significant.

Chapter 4.13, Transportation, Circulation and Traffic: This chapter is revised to include additional information on incompatible uses that could potentially increase safety hazards.

Chapter 7, “Report Preparation”: This chapter identifies the RDEIR authors and the consultants who provided analysis in support of the RDEIR’s conclusions.

Chapter 8, “References”: This chapter has been updated to reflect all sources of information used in the preparation of the RDEIR.

Appendices: This section contains a report prepared by Clearwater Hydrology dated June 23, 2009.

1.2 Relationship to the DEIR

Consistent with the requirements of Section 15087 of the State CEQA Guidelines, this RDEIR is being made available on September 15, 2011, for public review for a period of 45 days. The public-review period ends on October 31, 2011. During this period, the general public, agencies, and organizations may submit written comments on the RDEIR to DPR. Pursuant to procedures set forth in Section 15088.5(f)(2) of the State CEQA Guidelines, reviewers are requested to limit their comments to the materials contained in this RDEIR.

As required under Sections 15087 and 15088.5(d) of the State CEQA Guidelines, DPR has sent a Notice of Availability (NOA) to all those who submitted comments on the DEIR, to all organizations and members of the public who were on DPRs distribution list for the DEIR, and to any additional persons or organizations that have requested information about the EIR since the publication of the DEIR. This RDEIR and associated Notice of Completion (NOC) has been filed with the Governor's Office of Planning and Research - State Clearinghouse (OPR/SCH), which will distribute copies to interested state agencies. The DEIR and associated supporting documents will be posted on the DPR website at: http://www.parks.ca.gov/default.asp?page_id=982.

All inquiries regarding environmental compliance for this project should be addressed to:

Brad Michalk
California Department of Parks and Recreation
Northern Service Center
One Capitol Mall, Suite 410
Sacramento, CA 95814
Fax: (916) 445-8883
CEQANSC@parks.ca.gov Subject Line: Bill's Trail

After close of the comment period, DPR will consider all comments received on this RDEIR, prepare responses as required, and prepare the FEIR. The FEIR, which will consist of the DEIR, RDEIR, comments on the DEIR, comments on the RDEIR, responses to comments, and any text changes, will be considered DPR for certification if it is determined that the FEIR has been completed in compliance with CEQA.

All comments must be in writing and may be submitted by regular mail or email to the address indicated above, or by fax at (916) 445-8883; Attn: Brad Michalk. Submissions must be postmarked or received by fax no later than October 31, 2011. The originals of any faxed document must be received by regular mail within ten working days following the deadline for comments, along with proof of successful fax transmission during the designated comment period. Emailed submissions must include the full name and mailing address of the commenter. Comments received during the public review period will become part of the public record and will be included in the Final EIR.

1.3 Findings

CEQA Guidelines §15091indicate that no public agency will approve or carry out a project, for which an EIR has been certified, which identifies one or more significant environmental effects of the project, unless the public agency makes one or more written findings for each of those significant effects, accompanied by a brief explanation of the rationale for each finding. Findings have been incorporated into this RDEIR at the end of each revised topic of Section 4.0, Environmental Analysis that identifies a potentially significant environmental impact.

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2.0 PROJECT DESCRIPTION

2.1 Introduction

The intent of this document is to evaluate the environmental effects of the Trail Change in Use and Improvement Project at SPTSP.

2.2 Local and Regional Setting

SPTSP consists of approximately 2685 acres located in the coastal hills of Marin County. The park is located 6.5 miles west of the town of Fairfax and 2.5 air miles east of Olema (see Figure 1: Area Map). The rural community of Lagunitas sits on the east boundary of the park, while the town of Nicasio is just over the ridge to the northeast 1.7 miles away. Both Sir Francis Drake Boulevard and Lagunitas Creek bisect the park travelling southeast to northwest.

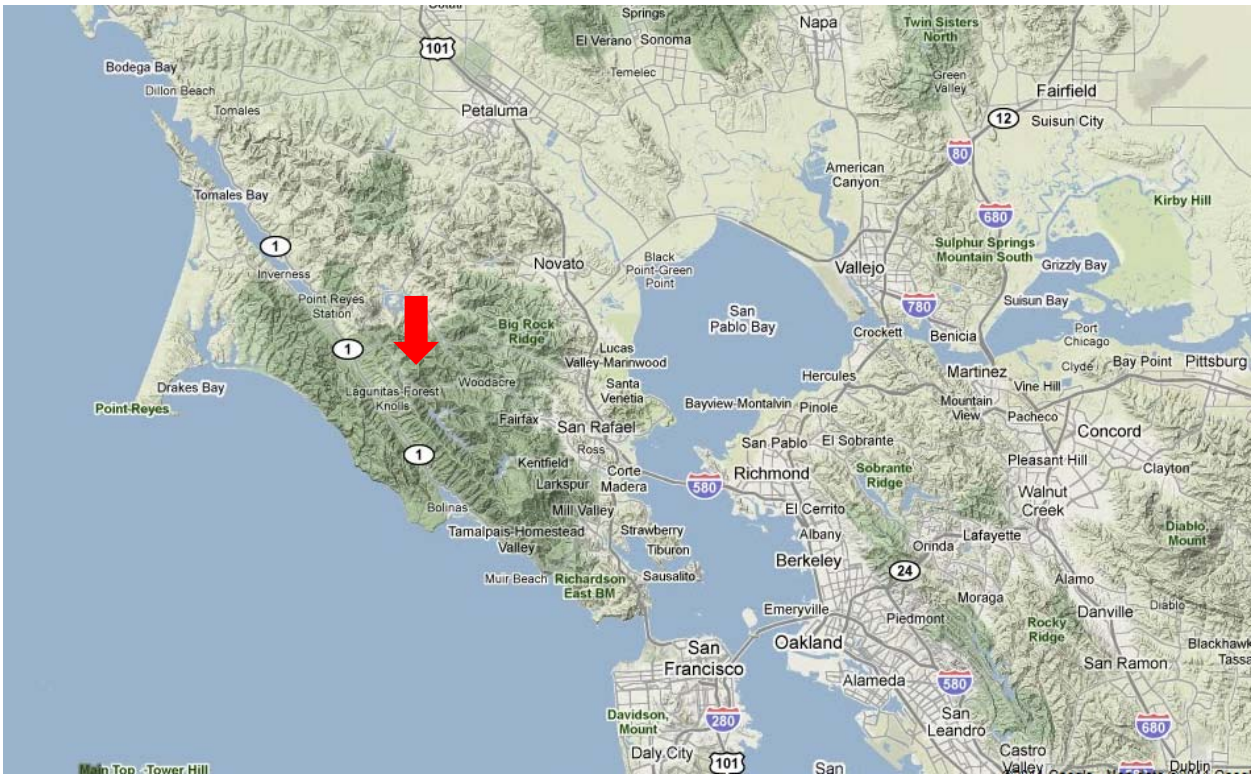

Figure 1: Area Map

2.3 Background

Bills' Trail is named for William "Bill" Lintow, a former park maintenance supervisor and Bill Taylor Northern Regional Maintenance Specialist (Price, 2011). The trail was constructed in 1988-1989 to connect Barnabe Fire Road to Devil's Gulch (see Figure 2). Originally constructed with a 48" bench, the trail has narrowed in places over the years, particularly on the upper portion of the trail near Barnabe Peak, through normal sloughing on the inside hinge and narrowing of the tread with vegetation overgrowth. Although the trail has received minimal maintenance, it has aged relatively well over the years with very little sediment washing from the trail into Devil's Gulch, a perennial tributary to Lagunitas Creek, considered prime habitat for listed species.

Although now restricted to hikers and equestrians Bills' Trail, was originally constructed as a full multiuse trail open to hikers, mountain bikers and equestrians. Sometime after its opening, DPR received complaints from equestrians about conflicts with mountain bikers. To resolve the conflict DPR attempted to restrict bikes to up-hill direction only; however, conflicts and complaints continued. Mountain bikes were finally excluded under a Superintendent's order; the trail has been used exclusively by hikers and equestrians since that time. (Hanson, 2011)

The following is a description of Bill's Trail prepared by Clearwater Hydrology (CH) on June 23, 2009:

> "Bills' Trail traverses primarily north –facing, upland slopes within the Devil's Gulch Watershed. Trail elevations range from roughly 200' at the Devil's Gulch Bridge crossing to 1,200' at the Barnabe Fire Road junction, just below Barnabe Peak. Trail grades range from nearly level to 11 percent, with the steepest segment occurring closest to the Devil's Gulch channel bed at a downslope distance of as little as 10-15'. Steep first and second order creeks draining similarly steep, forested slopes deliver sediment and debris to Devil's Gulch, which is aligned southwest-northeast. The trail alignment initially parallels the nearly vertical to vertical canyon walls formed by the main stem channel incision, and then turns gradually eastward and further from the channel. Once the trail begins a series of switchbacks, it is several hundred feet from the Devil's Gulch channel.
>
> The trail crosses two of Devil's Gulch's perennial tributaries numerous times, at designated bridge crossings Nos. 1-7. In addition, stabilized tributary crossing occur where perennial flow is absent. At these ephemeral channel crossings, logs and rock cribbing structures have been installed to allow subsurface drainage and maintain drier track conditions. Since upslope sediment has buried the upstream face of the structures it is likely that sediment and debris-laden flow does occasionally flow over the trail surface during higher intensity rainstorms.
>
> The upland physiography, or landscape, is composed of the incised, lower order stream channels and intervening, often pronounced, secondary ridges and small spur ridges separating these streams. Topographic hollows or swales are often located upslope of the headwaters of many lower order streams. Swales are often the source of rapidly moving debris-flows during periods of prolonged rainfall, and they can be a major source of stream sediment and debris.

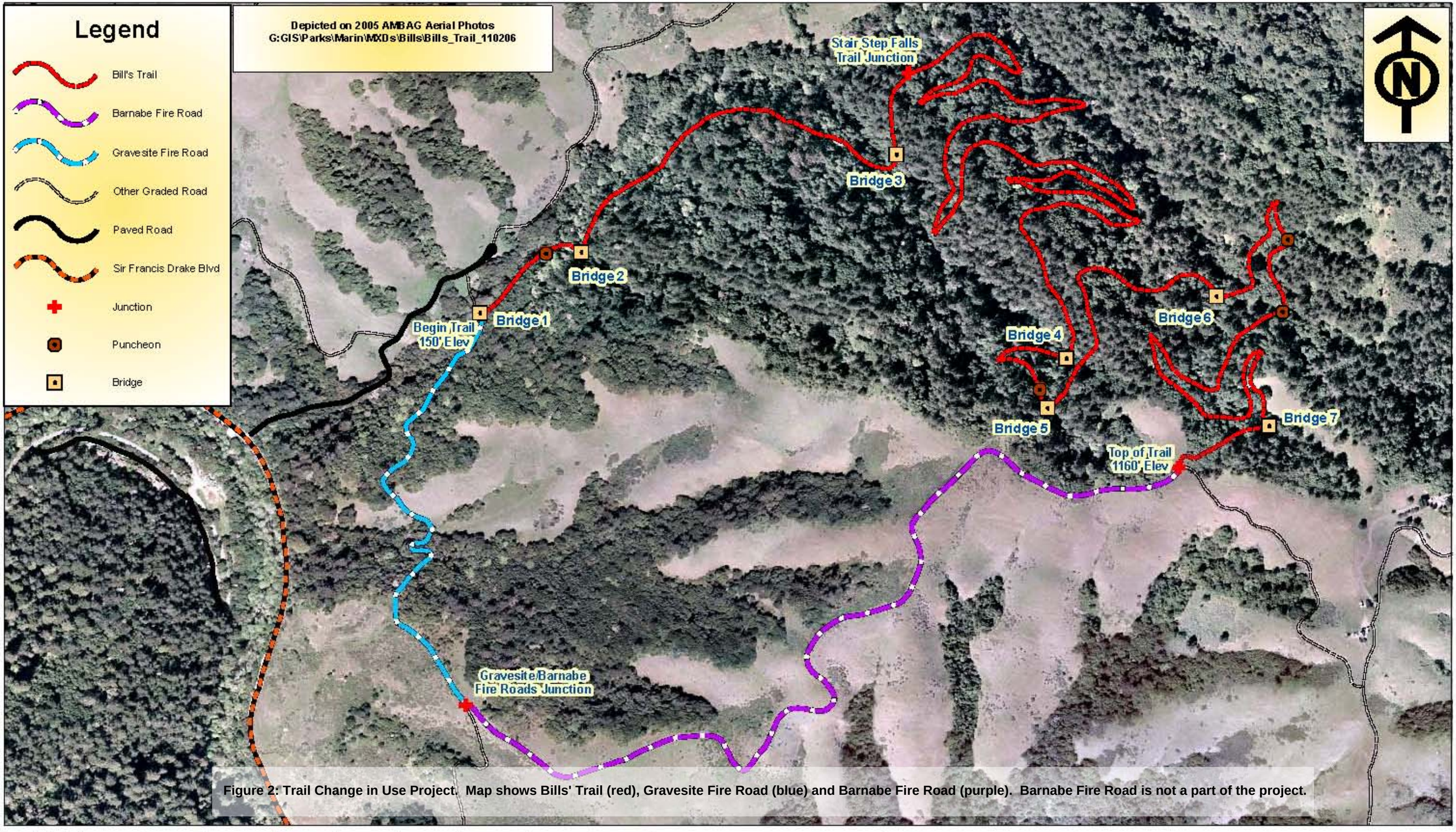

Figure 2: Trail Change in Use Project. Map shows Bills' Trail (red), Gravesite Fire Road (blue) and Barnabe Fire Road (purple). Barnabe Fire Road is not a part of the project.

Large to small topographic or benches or steppes of flatter gradient are scattered throughout the uplands of the Devil's Gulch watershed. One significant bench occurs alongside the main stream channel, opposite a point 2,000' or so upslope of the trailhead, occupying a stream terrace on the inside of a meander. The bench thins out in the upstream direction as the channel meander moves to the southern edge of the canyon. The benches or steppes located on the steeper mid-slopes of hillsides are typically of landslide origin.

Ongoing, erosive slope processes of variable rates (both temporally and spatially) are responsible for the development of the upland physiography and these processes also transport derived sediment to the upland channels (lower order streams). The lower order tributaries are often storage sites for upslope sediment. Delivery to the main stem channel occurs episodically in response to less frequent, more intense runoff-producing rainstorms and debris flows. In addition to slumps, earthflow, combined slump-earthflows, and debris-flow, sediment moves downslope in response to downslope creep, overland sheet-wash, rutting-rilling, and within the stream channels, gully head advancement and bank slumping.

In their dormant or suspended state of inactivity, such landslide features particularly large old flatter slumps, become storage areas for sediment eroded from above by both natural erosion and tail/road-induced erosion. Broader, convex ridges are also common storage areas for eroded trail and hillslope sediments. Sediment stored in hillslope depositional zones may not reach stream channels for hundreds to thousands of years. However, eroded hillslope or trail sediment that is transported downslope for short distances to tributary or main stem channel may reach receiving waters in the course of a single storm event."

Gravesite Fire Road

Gravesite Fire Road was originally constructed in part to provide maintenance access to a water well near Deadmans Gulch as well as the historic Taylor family gravesite. The road is narrow as it rises away from Devil's Gulch and widens as it approaches Deadmans Gulch. Gravesite Fire Road is open to mountain bikes, hikers and equestrians and provides a link between lower Bills' Trail and Barnabe Fire Road as well as the Madrone Group Campsite.

Gravesite Fire Road is poorly designed and is presently recognized as a direct source of sedimentation into Deadmans Gulch an ephemeral tributary to Lagunitas Creek. DPR prepared a Notice of Exemptions (NOE) in 2010 to perform temporary maintenance work to reduce sedimentation into Devil's Gulch. The proposed work would upgrade and install culverts and place rock at the outlet to improve drainage and reduce erosive conditions.

Nevertheless, additional improvements (including a minor trail relocation) are still necessary to portions of Gravesite Fire Road to reduce sedimentation into Deadmans Gulch and improve water quality.

2.4 Project Objectives

DPR's mission is to provide for the health, inspiration, and education of the people of California by helping to preserve the State's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality recreation. In addition to fulfilling the Department's mission statement, the project objectives include:

- Meet departmental policy to provide a multiuse trail;
- Provide additional sustainable opportunities for mountain biking within the DPR system;
- Provide an opportunity for high quality recreation while protecting resources; and
- Convert existing well-designed trails to multi-uses thereby reducing pressure from user groups to create use-specific new trails in pristine areas.

Without this project, sedimentation would continue to occur from Gravesite Fire Road resulting in impacts to prime habitat for listed species in Lagunitas Creek.

2.5 Change in Use Process

DPR's Policy No. 2005-06 is to provide trails to access park features and facilities and provide planning that will effectively meet near-term and long-term recreation activities. Multiuse trails and trail connectivity with adjacent public trail systems is considered in the development or changes to trail systems or individual trails.

DPR considers requests for trail use change (addition or removal) from both park staff and user groups. Once a request has been made, an evaluation of the trail is performed by qualified staff that considers circulation, safety, trail sustainability, soils and geologic conditions, as well as impacts to resources and park operations. In turn, a team, from Visitor Services, Resources, Maintenance and a Trails specialist prepares a detailed trail log based on the evaluation. Once the trail log is complete the trail expert with representatives from Visitor Services completes a detailed "Trail Use Change Survey". Technical Services, Natural and Cultural Services, Defensive Planning and Park Management also provide input on the survey.

Once the Trail Use Change survey is complete DPR staff makes a recommendation to the District Superintendent whether to move forward to the next step or deny the change in use. If the recommendation is to move forward the project goes through DPRs environmental review process. If the use request is denied, DPR staff meets with the requesting group and notifies them the request has been denied.

The environmental review process identifies and discloses to DPR and the public the significant environmental impacts of a proposed project prior to its consideration and approval. If potential adverse environmental impacts are identified, the CEQA process next attempts to identify ways to prevent or reduce these impacts by requiring consideration of feasible project alternatives or the adoption of mitigation measures for project impacts that cannot be avoided along with appropriate mitigation monitoring.

Mountain bike groups and individuals have petitioned to reopen Bills' Trail to mountain bikes. In 2009, DPR prepared a NOE to perform minor alterations to Bills' Trail to accommodate all users, consistent with CSP Policy Notice 2005.06. The proposal would have allowed mountain bikers and equestrians access to Bills' Trail on alternate days. Following considerable discussion from various interests groups, DPR rescinded the NOE on June 24, 2009, and opted instead to prepare an EIR for the project.

2.6 Policy Considerations

The DPR Operations Manual limits improvements undertaken within State Park units to those that make areas available for public enjoyment and education, consistent with the preservation of natural, scenic, cultural and ecological values. Improvements that do not enhance these resource values, are attractions in themselves (see DOM Section 0317.1.2), or are otherwise available to the public within a reasonable distance outside the park, cannot be undertaken within State Parks.

Attractions in themselves refer to those facilities that a portion of the public uses without experiencing the other opportunities for which a park was established (e.g. community centers, team sports complexes, destination restaurants), do not depend on location within a State Park and are prohibited. Attractions in themselves can have the following impacts:

- Reduce parkland available for resource-based outdoor recreational uses;
- Displace park users;
- Reduce the options and area for development of park facilities;
- Reduce the units sense of place;
- Reduce open space and habitat or restorable habitat acreage;
- Consume staff time for General Plan amendments, contracts and overseeing improvements.

Title 14 of the California Code of Regulations (CCR), Section 4301(i) provides authority to the Park Superintendent to issue special instructions (Superintendent's Order) to curtail or restrict activities in certain areas of the parks. Section 4326 makes it a crime to violate said order.

2.7 Mountain Biking

Mountain biking is a broad term used to describe a sport that consists of riding bicycles off-road using specially adapted mountain bikes. It first emerged in Marin County during the 1970s by cyclists seeking to explore unpaved trails (Kollar, 2011).

Since its introduction mountain biking has expanded and become more specialized (see Table 1). The sport now consists of multiple sub-categories including cross country (XC), trail riding, all mountain, downhill, freeride, street riding, dirt jumping and trials.

Table 1: Mountain Bike Riding Styles

Specific Mountain Bike Riding Styles	Description
All-Mountain	Riders seeking a variety of trails, especially those providing technical challenge. This style focuses on climbing and descending on varying terrain.
BMX or Dirt Jumpers	Riders looking for areas dedicated for jumping features. These riders often participate in other riding styles but focus on jumps.
Cross Country	Riders orientated towards longer distances (10-100 miles), multiple connecting loops and natural obstacles.
Downhill	Riders using specialized equipment on challenging, downward trails. This riding style is popular at ski resorts during the summer months.
Free Ride	Riders looking for technical challenge through features like rocks, bridges, jumps, logs, and drop-offs. Free riders can be found on all trails from cross country to dedicated experience zones.
Racing	A competition style of riding where riders race against each other and/or the clock. This style involves traveling over various terrain and features from a starting point to a finishing point.
Urban	A style of riding related to BMX but focusing on riding over challenging man-made features.

Most riding styles entail speed and/or navigating Technical Trail Features (TTFs). TTFs are armored natural features or built structures on trails that provide the rider physical and mental challenges. Riding styles that focus on the challenges of speed or TTFs are inconsistent with DPR DOM Section 0317.1.2 as these are essentially attractions in themselves. Consequently, the proposed project has been designed to reduce speed and eliminate as much as possible potential technical challenges that the aggressive mountain biker seeks.

XC riding most closely approximates the riding style that DPR envisions on Bills' Trail. XC mountain biking is defined by the terrain on which it is performed and consists of a mix of rough forest paths and single-track (although no single-track is being considered), smooth fire roads, and paved paths connecting other trails. On Bills' Trail the mode of transport is secondary and incidental to enjoyment of the natural, scenic, cultural and ecological values found within SPTSP.

2.8 Sustainable Trails

The National Park Service defines a sustainable trail as one that supports current and future use with minimal impact to the area's natural systems; produces negligible soil loss or movement while allowing vegetation to inhabit the area; recognizes that pruning or removal of certain plants may be necessary for proper maintenance; does not adversely affect the area's animal life; accommodates existing use while allowing only appropriate future use, and; requires little rerouting and minimal long term maintenance.

Bills' Trail is unique in that in spite of its setting within a sensitive environment and infrequent maintenance history, the trail remains in relatively good condition with little sedimentation discharged from the trail into Devils Gulch. Its stability in light of its maintenance history is in part, what makes the trail a good candidate for multiuse.

The following sections describe components of a sustainable trail:

2.8.1 Trail Tread

Normally, native soil used to construct the trail base is adequate to carry foot trail traffic. Imported tread surfacing can be used on heavy use trails, in wet areas, across rock slides, and equestrian trails. The depth and width of surfacing material is determined on a case by case basis depending on the quality of the native material.

Tread Maintenance consists of keeping the tread surface serviceable and consists of:

- Restoration of uniform out-sloped, in-sloped or crowned surfaces
- Restoration of original width
- Maintenance of backslope
- Filling of ruts and holes in the tread
- Restoration of sections damaged by slides, uproots, and washouts
- Removal of loose rocks
- Restoration of fill approaches
- Restoration of crown to turnpike with fine gravel of mineral soil

2.8.2 Trail Grade and Alignment

All land areas have an inherent and variable ability to sustain recreational use without suffering damage to soils, vegetation or water. This ability can be relatively low, especially in mountainous areas and forests with steep slopes and abundant water runoff.

As a general rule, the trail should not be steeper than 10%; grades of 1-7% are ideal. Some grade must be provided to adjust to drainage needs. Grade should undulate gently to provide natural drainage and to eliminate monotonous stretches, level stretches and long steep grades that tire users.

The ideal alignment will “fit” the trail to the ground, follow the contours of the land and offer the user views from the trail. When a switchback is necessary, it should use a topographic feature as a turning point so it does not appear to be ‘carved out of the hillside’.

2.8.3 Trail Drainage

Drainage control on a trail relates to two primary types of water control, surface and subsurface-water. Before a trail are constructed surface water flows in a sheet along the natural ground surface. After a trail is constructed the sheet flow is cutoff and channeled into the trail. If allowed to accumulate, this water will erode the trail surface. Subsurface water, one of the most troublesome drainage problems, is best handled by trail relocation. Alternate solutions are to lower the water table or to construct a puncheon, culvert or French drains.

The unchecked flow of water from rain has the highest ability to damage a trail. During heavy rain, a large amount of water is present at the surface; some water is absorbed directly into the soil, but when the soil is saturated the water that isn’t absorbed flows freely along the surface as sheet flow until it collects in small channels or streams.

Problems occur when the trail interrupts the natural drainage process and the trail becomes the stream channel. Trails in flat, low-lying, wet terrain as well as mountain bogs with highly organic, wet soils, are plagued by destruction of plants. Wet, slippery and muddy locations develop quickly on theses soils causing water puddling on the trail tread and force users to use the side of the tread causing soil breakdown and trail widening.

The following techniques can be used to divert water, stabilize damaged soils and allow trailside plant life to recover. The correct method to use depends on terrain features, volume of water involved and soil characteristics.

- Clear the stream channel up and down stream of logs, sticks, silt or other debris to decrease water flow or widening of the stream bed and crossing the trail.
- Maintain the out-slope by grading the trail so that the outside edge is lower than the inside edge to allow sheet flow to follow its natural course across the trail and downslope.
- Install drain dips (an exaggerated outslope that ends in a shallow trough) when runoff water is in excess of what a normal outslope design can accommodate.
- Install water bars (a physical structure across the trail that turns and directs water to the downhill side of a trail).
- Install/Clean a parallel ditch – excavate a depression parallel to the trail tread wide enough to carry the anticipated volume of water and maintain a ditch bank slope of 1:1; maintain a plant-free ditch.
- Install/Clean Culverts – when surface flows or underground springs are intercepted by a trail, a culvert can be placed perpendicular to the trail to redirect water to the downhill side of the trail.
- Install/Clean turnpikes (hardened trail tread raised above the ground through boggy, wet, or muddy areas) – water is collected and channeled by parallel ditches to culverts that carry the flow under the turnpike.
- Construct a rock causeway (an elevated section of trail contained by rock through permanent or seasonally wet areas) as inconspicuously as possible, as close to the minimum height and width needed to bridge the problem.
- Install a drainage lens to solve the low volume flows of springs or seeps that bisect a trail.

2.8.4 Trail Categories

Placing trails into class categories creates a management system to objectively assign standards and priorities that are consistent with the primary function, environmental sensitivity, the relationship to developed facilities and visitor use.

Class I – Includes accessible, equestrian and bike, interpretive, and hiking uses. Gravel, turnpikes, puncheons or other drainage structures are required in areas of trail trenching, trampling, multiple trails or saturated trail beds, for resource protection and visitor safety. The trail bed is 36-48” wide; trail clearing will be 8’ high and wide (4’ feet from trail center), equestrian trails will be 10’ high; brushing limits will be 8’ high, equestrian trail 10’ high; trail structures will have a 48” tread width and a minimum 40” tread width

between handrails and posts, equestrian bridges will have a 52” minimum tread width between handrails; ‘all access’ trail tread will be designed to accommodate wheelchairs and be a minimum of 5’ wide for two wheelchairs to pass one another.

Class II – Includes hiking trails providing access into regions away from developed visitor facilities, native material is used from the trail tread; drainage structures such as turnpikes or puncheons are only installed over wetlands; trail bed is a minimum of 24” wide and trail tread will vary from 18-24” depending on surrounding terrain. Trail clearing is the same as for Class I trails.

Class III – Includes lightly used hiking trails; native materials is used for trail tread; drainage structures are only installed as a mitigation measure; trail bed is a minimum of 18” wise and trail tread is 12-18” wide depending on surrounding terrain. Trail clearing will be 8 feet high by 6 feet wide.

Class IV – Special use and access trails; tread bed and tread work is minimal to provide safe footing; designed to avoid all need for structures and drainage controls; trail clearing limits are minimal for passage.

2.9 Detailed Project Description

Bills’ Trail is currently used by equestrians and hikers only. More recently, mountain biking interest groups have petitioned to open Bills’ Trail to biking as well. DPR proposes to change the ‘use’ of Bills’ Trail to allow mountain biking in addition to hiking and horseback riding making the trail consistent with the Department’s policy to construct multiple use trails. In order to convert the trail to Class I that would allow mountain biking, DPR must “catch up” with the deferred maintenance that has narrowed the trail, reduced drainage function, allowed exotic species to flourish and reduced user safety.

Bills’ Trail has a constructed width of 48", the standard for multi-use trails in State Parks and continues nearly four (4) miles between the trail head in Devil’s Gulch and the junction with the Barnabe Fire Road at 1,160-foot elevation. DPR staff completed a Trail Use Change Survey and prepared a trail log (Appendix D) identifying needed repairs, soil types, and features. The following summarizes the proposed work:

Trail Work

- Brush the trail from top of cut bank to top of fill-slope to maintain constructed trail width and original brushed line of sight;
- Improve trail out-sloping and remove any developing outer edge (berm) trail tread to original design width averaging 48” (from top hinge of fill-slope to bottom hinge of cut bank or back slope) to maintain drainage. Trail bench work will be limited to maximum of 6" in depth; ground disturbance will stay within the existing profile (top of cut bank to bottom of fill-slope);
- Remove debris collecting on the inside hinge to maintain trail width and remove loose debris;

Bridge Repair/Drainage

- Replace wood-armored ephemeral stream crossings with rock armored crossings, as needed;
- Install armored rock crossings at all ephemeral drainages and micro drainages to harden the trail tread. Specific work to include:
  - Manually excavate up to 18" of trail tread (in the ephemeral drainage) and backfill with large, flat-topped rock to provide a stable crossing;
  - Place rock in the ephemeral stream channel gradient;
  - Repair bridges as needed; no work would occur lower than existing bridge components within the bed and/or stream channel. Specific work to include:
  - Excavate bridge approaches (and abutments as necessary) outward to first substantive vegetation and backfill with gravel;
  - Install gravel surfacing to provide a stable tread surface at bridge approaches;

Resource Management

- Remove non-native eucalyptus trees identified by a DPR-approved Environmental Scientist to improve the stand management and encourage naturally occurring tree species.
- Where eucalyptus would be removed at least 75 square feet of basal area per acre (any tree species) would be retained on the slope;
- Logs hoisted to the trail would be suspended to minimize ground impacts;
- Construct closeable and lockable barriers at each bridge to facilitate closing the trail to users as necessary.

User Safety

- Construct pinch points with boulders or large logs (from existing downed trees on site or imported as needed) protruding onto the trail from each side creating the need to travel an 'S' path to negotiate the path through the logs. Pinch points will be placed in approximately 100 locations along Bills' Trail to reduce bicycle speed and increase the 'line of sight" at curves, improving user safety.
- Install signage to inform user groups how to have a safe and fun trail experience without conflict;
- Repair, replace or install split rail fencing along trail as needed for safety, resource protection, and shortcut prevention;

Gravesite Fire Road

- Improve and rehabilitate limited sections of road as needed per California State Park guidelines (Brian R. Merrill, 2003)
- Ditchouts and rolling dips will be armored with aggregate at and near the outlet to reduce erosion. Aggregate would transitionally increase in size toward the outlet end.

No work will be performed on Barnabe Fire Road; it is not a part of this project

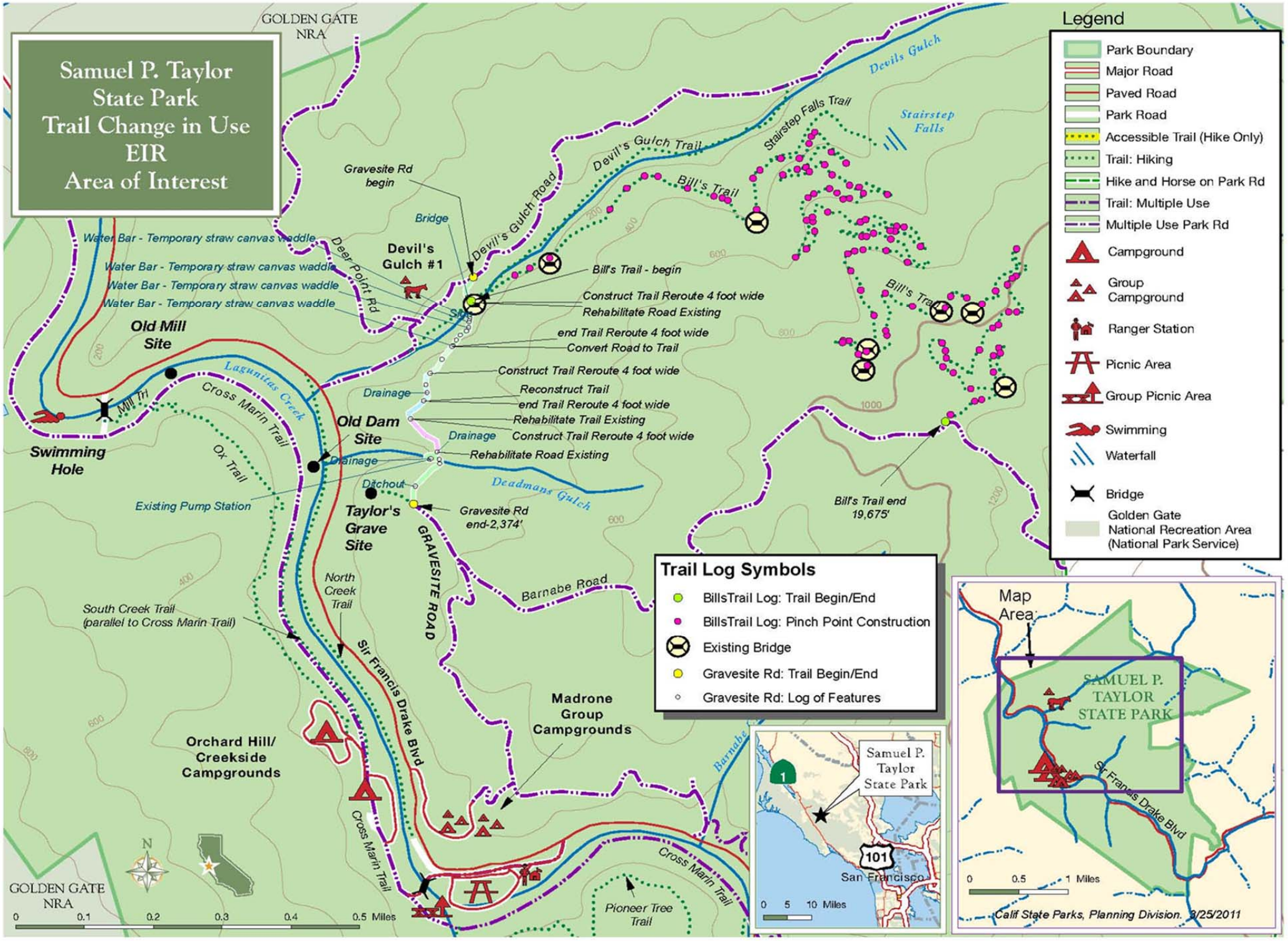

Figure 3: Proposed Trail Improvements

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2.10 Project Requirements

DPR has two types of Project Requirements: Standard and Specific. Standard Project Requirements are applied to projects statewide at all parks as required, and were developed from Best Management Practices (BMPs) and known regulatory requirements. For example, a Standard Project Requirement addressing the treatment of the inadvertent discovery of archaeological features is assigned to all projects statewide that include ground-disturbing work. However, for a project that does not have ground disturbance, such as replacing a roof on a historic structure, this Standard Project Requirement would not be necessary and therefore not applied to the project. Specific Project Requirements are written for, and applied to projects based on specific actions unique to a project and/or area that are necessary to complete the project while protecting resources. Table 2 lists Standard Project Requirements and Specific Project Requirements that will be incorporated into the Project, as applicable.

After incorporating the Requirements into the project description, whether standard or specific, DPR evaluates the significance of impacts based on CEQA Guidelines Section 15064.5 and Appendix G. After further impact analysis, if impacts are potentially significant or are potentially significant and unavoidable, DPR provides mitigation measure(s) to reduce impacts to a less than significant level. Continuing with the analysis, DPR could determine that although Project Requirements and mitigation measures have been included, project impacts are significant and unavoidable; therefore, could provide a Statement of Overriding Consideration (see Section 6.5).

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Table 2: Standard and Specific Project Requirements

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
Air Quality	
Standard Project Requirement AIR 1: Ozone-Related Emissions	▪ DPR and its contractor(s) will maintain all construction equipment in good mechanical condition, according to manufacturer's specifications. Construction equipment exhaust emissions will not exceed Bay Area Air Quality Management District (BAAQMD) Regulation IV – Rule 400 – Visible Emissions limitations (Cal EPA 2007b). ▪ All off-road and portable diesel-powered equipment, including but not limited to bulldozers, graders, cranes, loaders, scrapers, backhoes, generator sets, compressors, auxiliary power units, will be fueled with California Air Resources Control Board (CARB)-certified motor vehicle diesel fuel. ▪ Idling time for all diesel-powered equipment will be limited to five minutes, except as necessary to maintain a continuous workflow or for safety considerations. ▪ The use of diesel construction equipment meeting the CARB's 1996 or newer certification standard for off-road heavy-duty diesel engines will be maximized to the extent feasible. ▪ Electric and/or gasoline-powered equipment or equipment using alternative fuels, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, or biodiesel, will be substituted for diesel-powered equipment, when available.
Standard Project Requirement AIR 2: Particulate Matter Fugitive Dust Emissions	▪ Ground-disturbing activities will be suspended when sustained winds exceed 25 mph, instantaneous gusts exceed 35 mph, or dust from construction might obscure driver visibility on public roads. ▪ Disturbed areas of the site will be watered as necessary depending on the conditions, using water trucks and/or sprinkler systems, to prevent airborne dust from leaving the site. If available, reclaimed (non-potable) water will be used. ▪ All dirt stockpiles would be covered (tarped) or watered daily, as necessary to prevent dispersion of windblown dust. ▪ All trucks hauling dirt, sand, soil, or other loose materials would be covered or would maintain at least two feet of freeboard (minimum vertical distance between top of load and top of trailer), in accordance with California Vehicle Code Section 23114. ▪ All disturbed areas in inactive portions of the site would be covered, seeded, and/or watered until a suitable cover is established or construction activities are resumed. Non-toxic soil stabilizers

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
	could be used in accordance with county, Regional Water Quality Control Board (RWQCB), (CRWQCB) and California Air Resources Board (CARB) standards. ▪ Permanent dust control measures would be implemented as soon as possible following completion of any soil disturbing activities. ▪ The name and telephone number of such persons will be posted on site throughout construction and provided to the BAAQMD. The phone number of the Bay Area Air Quality Management District will also be visible to ensure compliance with Rule 402 (Nuisance) (CEPA 2007b). Project requirements would also be implemented during holidays, weekend periods, or times when work is temporarily suspended, as necessary to control site conditions generating fugitive dust.
Biological Resources	
Specific Project Requirement BIO 1.1: Marin blind harvestman	▪ A DPR-approved biological monitor will survey for species of harvestman prior to any project activities that require the moving of any medium to large sized rocks. If any specimens are located then the DPR-approved biological monitor will relocate the species to a suitable location outside of the project area.
Specific Project Requirement BIO 1.2: Marin Hesperian	▪ If any snail species is found on the project site while work activities are being conducted, work in the vicinity of the snail will be delayed until the species is relocated to a suitable location outside of the project area by a DPR-approved biological monitor.
Standard Project Requirement BIO1.3: California red-legged frog	▪ Construction personnel will be instructed by a USFWS or DPR-approved biological monitor in the life history of the California red-legged frog and its habitat, and instruction in the appropriate protocol to follow in the event that a California red-legged frog is found onsite. ▪ A USFWS -approved biological monitor will be onsite during all activities within 500 feet of perennial streams to ensure there are no impacts to individual California red-legged frogs that might potentially move through the project area on dispersal. ▪ Immediately prior to the start of work each morning a USFWS or DPR-approved biological monitor will conduct a visual inspection of the construction zone, prior to the start of work. ▪ If a California red-legged frog is found, start of work at that project location will be delayed until the species moves out of the site on its own accord, or is relocated by a USFWS-approved biologist. ▪ Work will be confined to daylight hours to avoid activities during periods when California red-legged frogs are known to be active.

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
Standard Project Requirement BIO 1.4: Northern Spotted Owl	▪ If possible, all noise-generating construction activities will occur outside of the breeding season for the northern spotted owl (September 1 – January 31). The specific dates of the breeding season could be adjusted through consultations with USFWS based on the characteristics of the local population ▪ If construction activities must be scheduled during the breeding season, protocol-level surveys by a USFWS or DPR-approved biologist will be conducted prior to construction to locate nests, or survey data from local biologists monitoring owl populations in the area may be used if appropriate. ▪ If a breeding pair and/or nest are located during surveys, then no construction activities resulting in noise disturbance above ambient levels may occur within ¼ mile of the nest during the breeding season.
Standard Project Requirement BIO 1.5: Nesting Raptors and Migratory Birds	▪ If possible, all noise-generating construction activities will occur outside the raptor and migratory bird breeding season (September 16 – January 31). ▪ If construction-related activities must be scheduled during the breeding season, then focused surveys for nesting migratory bird and raptor species will be conducted by a DPR-approved biologist before construction activities occur in these months to identify active nests. ▪ Surveys for active raptor nests will be conducted within a 500-foot radius of the project area 10 days prior to the beginning of construction at each work site. If nesting raptors are found, no construction will occur within a 500-foot radius of the nest until the young have fledged and the young will no longer be impacted by project activities (as determined by a DPR-approved biologist) and there is no evidence of a second attempt at nesting. ▪ Surveys for active migratory bird nests will be conducted within a 100-foot radius of the project area 10 days prior to the beginning of construction at each work site. If active nests are located, then no construction activities will occur within a 100-foot radius of the nest tree until the young have fledged and the young will no longer be impacted by project activities (as determined by a DPR-approved biologist).
Standard Project Requirement BIO 1.6: Sensitive Bat Species	▪ If possible, all noise-generating construction activities will occur outside the bat maternity season (September 1 – January 31). ▪ If project activities must be conducted during the bat maternity season then a DPR-approved bat specialist will conduct a survey for bats within 100 feet of those project areas with suitable bat habitat. If bat roosts are observed, a buffer of 100 feet will be established around the roost in which only those project activities could occur without significant impacts to bats within the buffer

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
	zone, as determined by the bat specialist.
Standard Project Requirement BIO 2.1: Sensitive Natural Plant Communities	▪ Within the root health zone (5 times dbh) of any native tree with a dbh of 12 inches or greater, no roots with a diameter of 2 inches or greater will be severed by project activities, unless authorized in advance by a DPR-approved biologist.

Standard Project Requirement BIO 2.2: Sudden Oak Death	▪ All project activities that could spread Phytophthora ramorum to new locations will be subject to Best Management Practices (BMPs) developed by the California Oak Mortality Task Force and available online at http://www.suddenoakdeath.org/html/best_management_practices.html.
	▪ Sudden Oak Death BMPs include but are not limited to:
	  ▪ Inform personnel that they are working in a Sudden Oak Death (SOD)-infested area, unauthorized movement of plant material is prohibited, and the intent of these prevention measures is to prevent spread of SOD.
	  ▪ Before leaving project area, remove or wash-off accumulations of plant debris, soil, and mud from shoes, boots, vehicles, and heavy equipment, etc. Clean with denatured alcohol or similar materials.

Standard Project Requirement BIO 3: Wetlands, Riparian Zones, and Waters of the U.S.	▪ A wetlands and waters of the United States delineation report will be prepared and submitted to the appropriate office of the U. S. Army Corps of Engineers (USACE) for jurisdictional determination under Section 404 of the Clean Water Act. ▪ If required by the USACE a 404 permit under the Nationwide Permit Program will be obtained for this project and all conditions imposed by the permitting authority will be implemented.
Cultural Resources	
Standard Project Requirement CULT 2: Previously Undocumented Resources	▪ In the event that previously undocumented/unflagged cultural resources (including but not limited to dark soil containing shellfish, bone, flaked stone, groundstone, or deposits of historic material) are encountered during project activities, all work in that location will be temporarily halted and diverted to another location, until DPR's State Representative is contacted; a DPR-qualified cultural resource specialist will record and evaluate the find and work with the Project Proponent and/or Construction Contractor to implement avoidance, preservation, or recovery measures, as appropriate, prior to any work resuming at that specific location.
Standard Project Requirement CULT 3: Human Remains	▪ In the event that human remains are discovered during Program Actions, all work at that location will be temporarily halted and diverted to another location. Any human remains and/or funerary objects will be left in place. The Project Proponent and/or Construction Contractor will

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
	immediately contact the DPR State's Representative who will then contact the DPR Sector Superintendent. The DPR Sector Superintendent (or authorized representative) will notify the County Coroner, in accordance with §7050.5 of the California Health and Safety Code, and the Native American Heritage Commission (NAHC) will be notified within 24 hours of the discovery if the Coroner determines that the remains are Native American. The NAHC will designate the "Most Likely Descendent" (MLD) of the deceased Native American. The MLD will recommend an appropriate disposition of the remains. If a Native American monitor is at the Park at the time of the discovery, and that person has been designated the MLD by the NAHC, the monitor will make the recommendation of the appropriate disposition. Work will not resume in the area of the find until proper disposition is complete (PRC §5097.98). No human remains or funerary objects will be cleaned, photographed, analyzed, or removed from the site prior to determination. If it is determined the find indicates a sacred or religious site, the site will be avoided to the maximum extent practicable
Geology and Soils	
Standard Project Requirement GEO 1 Best Management Practices	▪ Bare earth materials at water course crossings will receive 80% to 85% mulch cover using on site native materials. Where the ground is not mulched, native vegetation will be planted. ▪ Brushing of trail cuts will minimize the damage to root systems to help retain vegetation on the cut-slope. Upon removal of temporary sidecast and initial sediment flush controls lighter materials will be collected from brushing and placed (as feasible considering the steepness of the slope) as an additional filter at the trail edge where it is at the top of the banks of the main stem of Devil's Gulch or within the buffer limits for sidecast control (0 to 30, 130 to 375 and 8475 to 8510). Aggregate will also be placed along the same trail section. ▪ Rock will be obtained from a Surface Mining and Reclamation Act (SMARA) approved quarry and contain no more fines than necessary to act as a binder. Aggregate will be placed at crossings to inhibit rutting per the guidelines of the governing regulatory agency. ▪ Where eucalyptus will be removed at least 75 square feet of basal area per acre (any tree species) will be retained on the slope. Logs hoisted to the trail will be suspended to minimize ground impacts. ▪ To inhibit moisture capture logs used for pinch points will be no longer than necessary. Logs will not be placed within the buffers for watercourses outlined for sidecast and initial sediment control. ▪ Ditchouts and rolling dips along the fire roads will be armored with aggregate at and near the

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
	outlet (if founded in fill) to inhibit erosion. Alternatively, the fill will be removed from the outlet of the drainage structure.
Specific Project Requirement GEO 2 Seismic Event	▪ In the event of a large earthquake on a nearby fault or significant rainfall event, the trail will be inspected to determine if cracks or cutbank failures could contribute sediment to nearby watercourses – if such material is identified it will either be stabilized or relocated outside the buffer zone identified for sidecast materials.
Specific Project Requirement GEO 3 Revegetation Plan	▪ This project will result in temporary impacts to native vegetation resulting from proposed trail improvements. These impacts will be addressed by implementing a revegetation plan that will restore native plant habitat in affected areas. The objective is to establish self-sustaining native vegetation. This plan will include the following elements: ▪ Identification of areas requiring revegetation; ▪ Identification of native species that are appropriate and site specific; ▪ Requirement that plantings be grown from native seed/cuttings collected in the park or plantings from local nurseries that are derived from genetic stock that was obtained from areas surrounding the park; and ▪ A monitoring and maintenance program that includes follow-up plantings as necessary to achieve success criteria as outlined in this plan.
Hazards and Hazardous Materials	
Standard Project Requirement HAZ 1 a-c Spill Prevention	▪ Prior to the start of construction, the Contractor will inspect all equipment for leaks and inspect equipment daily thereafter until it is removed from the project site. ▪ Prior to the start of construction, the contractor will prepare a Stormwater Pollution Prevention Plan (SWPPP) that will include Best Management Practices (BMPs) for materials management, fueling, repair, and maintenance of vehicles and equipment, and spill prevention and control. The Contractor will maintain a spill kit on-site throughout the life of the project. The SWPPP will include a map that delineates construction staging areas and where refueling, lubrication, and maintenance of equipment may occur. Areas designated for refueling, lubrication, and maintenance of equipment will be at least 50 feet away from all streams. In the event of any spill or release of any chemical in any physical form at the project site or within the boundaries of the Park during construction, the contractor will immediately notify the appropriate DPR staff (e.g., project manager, supervisor, or State Representative). ▪ Equipment will be cleaned and repaired (other than emergency repairs) outside the park

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
	boundaries. All contaminated water, sludge, spill residue, or other hazardous compounds will be disposed of outside park boundaries, at a lawfully permitted or authorized destination.
Standard Project Requirement HAZ 2 Health and Safety	▪ DPR will include, in any contract documents or in internal work plan documents, health and safety specifications on how to manage any potential hazardous incidents. The specifications will include methods for safe handling, collection, and proper disposal of any contaminated soil and refuse uncovered during the excavation and grading procedures. The specifications will discuss the proper personal protection during construction, the use of an exclusion zone if necessary to prevent exposure to the public, and the proper disposal procedures for any hazardous substances encountered.
Project Specific Requirement HAZ 7 a-c – Fire Safety	▪ A fire safety plan will be developed by the contractor and/or DPR and approved by DPR prior to the start of construction. This plan will include the emergency reporting procedures of the Marin County Fire Department. ▪ Spark arrestors or turbo-charging (which eliminates sparks in exhaust) and fire extinguishers will be required for all heavy equipment. ▪ Construction crews will be required to park vehicles away from flammable material, such as dry grass or brush. At the end of each workday, heavy equipment will be parked over asphalt or concrete to reduce the chance of fire. The contractor will also be required to have fire extinguishers on site.
Hydrology and Water Quality	
Standard Project Requirement HYDRO 1: Erosion, Sediment Control and Pollution Prevention	▪ A Stormwater Pollution Prevention Plan (SWPPP) will be required that includes temporary construction and permanent post-construction Best Management Practices (BMPs) to control soil and surface water runoff, including, but not limited to, use of silt fences, weed-free straw bales, weed-free fiber rolls, and/or sediment detention basins to prevent soil loss and siltation. SWPPP will also include measures to allow construction to occur outside the normal construction season. Long term revegetation BMPs will be guided by the Project Revegetation Plan (see Bio 10, Revegetation Plan). ▪ The SWPPP will also include spill prevention, vehicle and equipment management, and materials management BMPs to prevent releases of non-sediment pollutants, such as vehicle and equipment fluids and any construction-related materials. ▪ Flow will not be concentrated toward the slump near 7010 and if other drainage modifications are made will not divert flow from one micro-watershed to another for slopes below the Barnabe and Gravesite fire roads. Berms will be removed from the road edge where consistent with

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
	vehicular safety and micro-drainage integrity can be respected. ▪ Trail construction activities will occur between April 15 and October 15 each year to avoid the period of highest rainfall, streamflows and erosion potential. During periods of inclement weather, operations will be shut down until streamflows are sufficiently low and soil/channel conditions are sufficiently dry and stable to allow construction to continue without the threat of substantial soil compaction, erosion, sedimentation, or offsite sediment transport. Construction activities can occur outside of this window outside of riparian areas if winter season operating conditions permit and with appropriate BMPs in place. ▪ No excavation work will occur on slopes greater than 10% during periods of heavy rains (at least ½ inch of precipitation in a 24-hour period) or when soils are saturated. ▪ Work will be directed and/or inspected periodically on-site by the Project Manager or other qualified personnel to assure soil compaction and finish grading meet job specifications. ▪ Plant duff and organic soil will be removed from graded areas and stored. After grading is complete the stored material will be spread over disturbed areas intended for revegetation as identified in the Project Revegetation Plan.
Specific Project Requirement HYDRO 2: Initial Trail Closure	▪ The trail and road will be closed during construction and remain closed for one year following completion of construction to allow the trail to season. Gates will be constructed at each of the 7 bridge crossings that will remain locked until the trail is open for use.
Specific Project Requirement HYDRO 3: Seasonal Trail Closures	▪ Bills' Trail will be closed seasonally during periods of saturated and softened soils to maximize sustainability, minimize trail maintenance, and support resource protection by limiting potential rain generated sediment transport. Closure will be ensured by locked gates at each of the 7 bridge crossings including the bridge over Devil's Gulch.
Noise	
Specific Project Requirement NOISE 1: Construction Noise Reduction Plan	▪ Prior to the start of construction, DPR and/or its Contractor will prepare a Construction Noise Reduction Plan that will address noise control methods during construction activities at the project site and in staging and storage areas. Measures identified in the Construction Noise Reduction Plan will be implemented by DPR and/or its Contractor throughout the construction period and monitored by DPR. The plan will be approved in advance by Marin County Community Development Agency and conform to noise reduction requirements of the County.
Standard Project Requirement NOISE 2: Noise Exposure	▪ Project-related activities could occur seven days per week and will generally be limited to the hours of 7:00 a.m. to 6:00 p.m.,

PROJECT REQUIREMENTS	PROJECT REQUIREMENT DESCRIPTION
	▪ Internal combustion engines used for any purpose in the project areas will be equipped with a muffler of a type recommended by the manufacturer. Equipment and trucks used for project-related activities will utilize DPR-approved noise control techniques (e.g., engine enclosures, acoustically attenuating shields or shrouds, intake silencers, ducts, etc.) whenever feasible and necessary. ▪ Stationary noise sources and staging areas will be located as far from visitors as possible. If they must be located near visitors, stationary noise sources will be muffled to the extent feasible, and/or where practicable, enclosed within temporary sheds.

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2.11 Analytical Methodology

In determining the appropriate analytical methodology for this DEIR, DPR followed the following steps:

Step 1: Incorporation of Standard and Specific Project Requirements into the Project.

DPR reviewed potentially applicable environmental protection measures that it has used for other projects throughout the State and selected those that were deemed applicable to the Project. Next, DPR reviewed environmental protection measures that could be incorporated into this Project at the Park. As discussed below in Section 2.5.2, these measures are titled Standard Project Requirements and Specific Project Requirements, respectively. Standard and Specific Project Requirements were then incorporated into the Project.

Step 2: Impact Analysis

After incorporating Project Requirements, DPR next evaluated the significance of potential impacts of the Project on the full ranges of CEQA resource topics. Many of the potential impacts were determined to be less than significant; however, DPR proceeded to Step 3, Mitigation, for impacts that could not be reduced to a level of less than significant through incorporation of Project Requirements.

Step 3: Mitigation

For impacts that were either potentially significant or potentially significant and unavoidable, DPR provided mitigation measures that reduced these impacts to the extent feasible. DPR then reviewed the potential impacts, and made applicable findings as described in Step 4, below.

Step 4: Findings Determination

After incorporation of Project Requirements and Mitigation, DPR determined the significance of impacts to environmental resources issues. Each resource section provides applicable findings for each significance determination. In addition, Section 6.0, Significance of Environmental Impacts, organizes these findings based on whether such findings were no impact, less than significant, potentially significant or potentially significant and unavoidable.

2.12 Project Implementation

Work would generally occur Monday through Friday, during daylight hours. Weekend or holiday work could be implemented to accelerate the construction schedule or address emergencies or unforeseen circumstances.

The ground upslope and down slope of the average 48” trail edge is steep and does not allow off road staging areas or simple equipment turn around. On Bills’ Trail (and Gravesite Fire Road north of Deadmans Gulch) work crews would plan carefully to bring

equipment in, stage and turn along the trail, particularly where the trail narrows. Due to site constraints, work in these areas would require the use of specialized equipment including mechanized wheelbarrows, hand operated mechanized compactors and assorted hand tools. The open space adjacent to the Horse Camp would be used as a staging area for work on Bills' Trail.

Because of the generally wider profile, work on Gravesite Fire Road allows a greater variety of construction equipment options. In addition to the equipment noted above, work on the road could also employ a Bobcat®, backhoe, a dump truck, grader, and larger dozer and transport vehicles. Numerous open areas along Gravesite Fire Road can serve as staging areas for this project component. Most equipment would be transported to the site and remain until the associated work is completed. Transport vehicles for material or equipment, delivery trucks, and crew vehicles would also be present intermittently at the site.

The trail and road will be closed during construction and remain closed for one year following completion of construction to allow the trail to season. Additionally, Bills' Trail will be closed seasonally during periods of saturated and softened soils to maximize sustainability, minimize trail maintenance, and support resource protection by limiting potential rain generated sediment transport.

2.13 Trail Maintenance

DPR is responsible for the maintenance and management of over 1,500 trails and pedestrian routes throughout the most biologically diverse state in the nation. State Park trails provide a wide variety of experiences to the visitor, from outstanding vistas, including opportunities for wildlife viewing, to access to significant natural and cultural features in an unparalleled range of environmental settings. These routes are an integral component of the many programs and facilities that DPR is trusted to interpret, maintain, and protect.

The State Trails Handbook recommends that trail maintenance activities be prioritized between essential and nonessential activities. DPR considers essential those activities that ensure visitor safety and protect the resource and trail investment. Nonessential activities are those which are directed solely toward visitor convenience.

Trail work directed mainly toward nonessential activities could sacrifice resource protection through the neglect of essential maintenance activities. Neglect of drainage maintenance can develop into a situation where a trail system could literally be washed away. On the other hand, a trail that receives no clearing or brushing could grow over to a point of physical closure with little resource or safety problems.

DPR recognizes that a firm annual maintenance program prevents expensive reconstruction projects. With the understanding that there is a limited amount of money and manpower for trail work, that work should be directed toward the factors that are causing the most damage. Ideally, drainage maintenance, clearing, tread maintenance and brushing are considered annual trail maintenance and performed as a unit.

Construction, reconstruction, rehabilitation and restoration are considered facility trail maintenance and performed on a project basis.

In the spirit of partnering with other entities for park operations, DPR will continue to seek opportunities to share maintenance responsibilities with trail users and user groups.

2.14 Trail Safety and User Conflict/Rule Enforcement

DPR trails are not intended as active recreation facilities where nature appreciation may be secondary to athletic or skill challenge. Mountain bike speed or technical riding, equestrian endurance or poker runs, and group trail runs are examples of activities that are not compatible with DPR trails, except potentially by specific plan and design in State Recreation Areas that do allow more active recreational activities. DPR trails are designed to accommodate passive, nature-oriented type of shared trail use by combining the design requirements for each individual use into a trail where they can comfortably mix.

Figure 4 Yield Triangle

Public safety is part of the mission of DPR, and trail design for shared use is an important safety consideration. However, user safety particularly depends on compliance with the appropriate type of trail use, and rules and guidelines for trail use, including reasonable speed, yielding to other users per the "yield triangle", warning when passing, and having the appropriate knowledge or skill to be on trails shared with other users. Multiuse Trail Conflict Management entails getting the information to the trail users about appropriate trail use; monitoring trail use, encouraging compliance, and where necessary, responding to situations of non-compliance.

While public safety is of paramount concern for DPR, it should not be confused with conflict. Conflicts can be defined as a situation in which people perceive a threat (physical, emotional, power, status, etc.) to their well-being. Some conflicts may lead to safety issues and are appropriately addressed in Chapter 4.13. Preventing user conflicts, both with respect to safety and with user attitudes, is certainly a goal of the project. Conflicts related to user attitudes towards one another are considered to be social issues, which are not treated as significant effects on the environment under CEQA.

Policy No. 2005-06 outlines the procedure DPR uses for conflict resolution. The goal is to create an opportunity for more meaningful public input and could include: creation of an ad-hoc committee that will sunset when the issue is resolved, facilitating public meeting(s), sponsoring user forums, replying to letters, or any other activity that allows the public an opportunity for providing suggestions and/or relaying concerns.

2.15 Accessibility

All programs, services, and activities offered by a public entity must be accessible to persons with disabilities. Emerging trail design concepts are beginning to eliminate obstacles such as stairs and excessive linear grades, which often prohibit users with disabilities from enjoying trails. On March 15, 2011 the Department of Justice (DOJ) revised Federal guidelines that contain technical provisions for accessible trails allowing "other power-driven mobility devices" to be used by "individuals with mobility disabilities." The State Parks Accessibility unit continually rehabilitates existing State Park trails, campsites, and restrooms to comply with the Americans with Disabilities Act (ADA).

2.16 Park Closure

The DEIR was released for public comment in April 2011, prior to release of the State Park closure list in May. Since January, DPR has engaged in a collaborative process between Headquarters and the District Superintendents to identify and determine closures and plan for partnerships to keep as many parks open as possible.

Budgetary issues will continue to be a challenge to DPR for the foreseeable future and parks slated for closure face uncertain outcomes. Parks may be placed in caretaker status or secure partners / alternative funding sources. The ability for DPR to contract with partners will depend on the outcome of pending legislation (AB 42, Huffman) that would give the Department the authority to enter into operating agreements with non-profits.

2.17 Regulatory Requirements, Permits, and Approvals

Activities that might affect natural or cultural resources, traffic, and air or water quality could be subject to review and approval by local, state, and/or federal responsible/trustee agencies. Consultations, permits, and/or approvals could be required from the following agencies and organizations:

- United States Army Corps of Engineers (USACOE)
- U.S. Fish and Wildlife Service (USFWS)
- State Water Resources Control Board (SWRCB)
- California Department of Fish and Game (CDFG)
- San Francisco Regional Water Quality Control Board (SFWQCB)

4.0 ENVIRONMENTAL ANALYSIS

Per Section 15086 (see CEQA Guidelines, Section 15088.5, subd. (d)), where an agency determines that recirculation is required; the agency can satisfy its obligation by reissuing only the revised part or parts of the EIR, rather than a whole new document. "If the revision is limited to a few chapters or portions of the EIR, the lead agency need only recirculate the chapters or portions that have been modified" (see CEQA Guidelines, Section 15088.5, subd. (c)).

This Environmental Analysis section contains an expanded and augmented analysis of the environmental effects and potential adverse impacts resulting from the implementation of the proposed project, only with respect to the portions that have been modified subsequent to circulation of the DEIR. The “Existing Conditions” description however, has been included to provide context for the policy discussion. Please refer to the Draft EIR for a discussion of the issues and impacts that remain unchanged.

4.1 Aesthetics / Visual Resources

The DEIR’s Aesthetics / Visual Resources section contained an exhaustive discussion of the project’s potential impacts on these resources. It neglected to discuss some key regulatory issues governing aesthetic and visual resources, including what is referred to as an area’s “sense of place”. The sense of place refers to a site's unique experiential essence (sensory, emotional, intellectual, and spiritual) which sets it apart from all other places. Consequently, the RDEIR includes the relevant policy discussion and reconsideration of the thresholds of significance in light of these additional policies.

4.1.1 Existing Conditions

Although attendance figures are kept for SPTSP as a whole, no such figures are kept for Bills’ Trail specifically. As with most trails, Bills’ Trail can at times seem isolated and very few other visitors may be seen. On other days; however, visitors to Bills’ Trail will find themselves in the thick of many other nature and solitude-seeking users.

4.1.2 Regulatory Setting

The DPR Operations Manual is the basic natural resource policy document for the State Park System. These policies guide the management of DPR’s natural resources including intangible values such as scenic qualities. The following specific policies address Aesthetics / Visual Resources specifically and to its “sense of place”.

0312.1 Sense of Place

A specific area’s value as parkland can include consideration of the factors, including aesthetics, which contribute to its sense of place. These are the intrinsic values that pertain to the essential and inherent nature of a place -- aspects that are not necessarily defined by law, science, or economics. Sense of place identifies a site's unique

experiential essence (sensory, emotional, intellectual, and spiritual) which sets it apart from all other places. It describes the distinctive characteristics that a site possesses; this includes the elements that determine the uniqueness of its landscape, resources, development, and its history. These characteristics are part of what makes a particular site a worthwhile park unit. Components of a site's identity include:

- Physical features and appearance - Consist of the actual physical structure, characteristics, and all visible features of a place. This includes physiography, natural features, cultural features, land use, development intensities, visual quality, community character, climate, seasonal changes, etc.;
- Observable activities, functions, and events - How inhabitants or visitors interact with a space, i.e. how the landscape, coast, and the built environment are occupied or used (activity levels and use intensities). This can also include resource activities or events such as whale or bird migrations;
- Meanings and symbols - Concept of place as a cultural artifact, a place's meaning or value beyond its physical elements. This includes people's experiential responses (emotions, feelings, and physical/intellectual stimulation) when they visit a park, and what they later remember about their visit.

0312.2 Scenic Values and Viewshed

To park visitors, the scenery offers the most direct and observable indication of the attributes and integrity of units of the State Park System. Ranging in scale from intimate spaces to sweeping vistas, scenic environments are comprised of unified and harmonious visual elements that include natural, and perhaps man-made, features as viewed from within the unit. The principal objective in the management of scenic areas is preservation of the quality of the visual environment. More specific objectives in scenic resource management (applicable to this project) should be to:

- Identify and protect scenic resources and qualities;
- Avoid or minimize modifications to scenic resources;
- Remove intrusive human-made elements that are not significant cultural resources, including intrusive light and noise;
- Where modifications of scenic resources are necessary, design attractive structures, subordinate to the character of their surroundings and that appear to belong to their setting, in sympathy with the sense of place;
- Utilize visually harmonious materials, colors, textures, and scale that blend into and are subordinate to their landscape’s background; and

The aesthetic of scenic resources can be highly subjective. It is impossible to list all the considerations that might be included in scenic review which must be constantly in the mind of Department employees who have responsibility for scenic resources.

0312.2.1 Scenic Protection Policy

It is the policy of the Department that in each State Park System unit, environmental quality will be such that visitors are aware of being in a place of special merit because of their surroundings both within and without the unit. Manmade features within the unit and their maintenance will have special characteristics, which, in total, express a feeling

of environmental integrity that differs from areas where degrading and undesirable features and intrusions are commonplace. In particular, non-directional signs should be unobtrusive and subordinated to the character of their surroundings. Protection of a park's unit's viewshed requires being alert to and participating in the planning and regulatory processes of other local, state and federal agencies.

0312.4.1 Soundscape Protection Policy

The Department will preserve, to the greatest extent possible, the natural soundscapes of parks from degradation due to noise (undesirable human-caused sound) and will restore degraded soundscapes to the natural condition wherever possible. The Department will take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or natural resources (e.g. loud motorized equipment during critical mating and rearing periods).

4.1.4 Environmental Impacts, Project Requirements and Mitigation Measures

Methodology

With respect to the additional regulatory considerations, the discussion below identifies the project's potential impacts on visual resources and sense of place and measures to avoid, reduce, or mitigate the intensity and duration of those impacts.

The potential for change in visitor experience was evaluated by identifying projected increases or decreases in recreational trail use on the proposed Bills' Trail loop and determining whether these projected changes would affect the desired visitor experience.

The following thresholds for evaluating impacts on visual resources and visitor experience were defined:

- ***Negligible:*** The visual quality of the landscape and its sense of place would not be affected or the effects would be at or below the level of detection, would be short-term, and the changes would be so slight that they would not be of any measurable or perceptible consequence to the visitor experience. Visitors would not be affected or changes in visitor use and/or experience would also be below or at the level of detection and any effects would be short-term.
- ***Minor:*** Effects to the visual quality of the landscape and its sense of place would be detectable, although the effects would be short-term, localized, and would be small and of little consequence to the visitor experience. Changes in visitor use and/or experience would be detectable although the changes would be slight and short-term.
- ***Moderate:*** Effects to the visual quality of the landscape and its sense of place would be readily detectable, long-term and localized, with consequences at the regional level. Changes in visitor use and/or experience would be readily apparent and likely long-term. The visitor would be aware of the effects associated with the actions. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.

- ***Major:*** Effects to the visual quality of the landscape and its sense of place would be obvious, long-term, and would have substantial consequences to the visitor experience in the region. Changes in visitor use and/or experience would be readily apparent, severely adverse or exceptionally beneficial and have important long-term consequences. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Impact Statement AES 3: Construction and operational activities associated with the proposed project could potentially degrade the existing visual character or quality of the site and its surroundings.

As noted in Chapter 2.6 above, improvements undertaken within State Park units are limited to those that make areas available for public enjoyment and education. These improvements must be consistent with the preservation of natural, scenic, cultural and ecological values. Improvements which do not enhance these resource values, which are "attractions in themselves", cannot be undertaken within State Parks.

Attractions in themselves can result in reduce parkland available for resource-based outdoor recreational uses; displace park users; reduce a parks' sense of place; reduce open space; and consume staff time overseeing improvements.

Many of the mountain biking styles identified in Chapter 2, Table 1 rely on facilities that are essentially attractions in themselves. Some riding styles embrace speed while others challenge mental and physical capabilities. Aggressive riding styles could potentially displace users concerned about real or perceived threats to their safety as well as change the visual experience and natural ambiance of the trail. Therefore, accommodating mountain bikes on DPR trails requires careful planning to insure that the trail does not by design or by default, become such an attraction.

The trail's design minimizes the ability for rogue riders to attain high speeds, and minimizes features that could be used to "challenge" their physical or mental skills. By design, mountain biker seeking these types of challenges will seek out trails in other regional parks. The typical mountain bikers for which this trail has been designed are those that simply seek to enjoy the natural, scenic and ecological values, at speeds similar to those of hikers and equestrians. So, while there may be an increase in mountain bikers and a corresponding decrease in existing users, it is expected that this increase will be temporary. Once they experience the speed-limiting nature of the trail many mountain bikers will likely choose to ride other trails that better appeal to their style of riding and the spike in this user group will ultimately flatten.

Nevertheless, effects to the visual quality of the landscape and its sense of place could be readily apparent with the change in use project. Changes in visitor use and/or experience could also be readily apparent and long-term with the project. The following mitigation measure, however; would reduce the potential impact to a less than significant level on aesthetics and visual resources.

Mitigation Measure AES 1 – Annual Reporting will require inspection of the trail annually and as needed to ensure that natural resources (including aesthetics) are not impacted by the change in use.

Level of Significance Before Mitigation:	Potentially Significant
Mitigation:	AES 1 Active Management and Maintenance

Qualified DPR staff will annually (or as needed) inspect the trail during the first three years following reopening to users and will prepare a report regarding CEQA-related issues (does not include user conflict), available for public review at District Headquarters. The report will include, but not be limited to the following for each issue:

- Trail Sustainability (additional users, impacts and trail degradation);
- Impact identification, including source of impact if possible;
- Recommendations to remedy impact
- Follow up on remedy effectiveness in 3 months

If after, re-inspection: park staff determines the remedy to be effective, no further action is required on that issue; if DPR staff is unable to remedy an identified issue, a Superintendent's Order could be used to immediately reduce user type, seasonally or permanently close the trail, and/or any other action deemed necessary to protect the impacted resource or user groups. DPR staff will utilize a Trail Use Survey to determine which user groups can maintain trail sustainability.

4.1.6 Findings

With the integration of Project Requirements and Mitigation Measures AES 1, temporary impacts to the scenic vista, scenic resources, and the visual character of the area would be less than significant.

4.3 Biological Resources

The DEIR contained a list of sensitive, candidate and special status species found in SPTSP and its vicinity, an assessment of potential construction-related impacts to said species as well as appropriate measures to ensure impacts remain less than significant. It erred by omission discussion of BIO 4 as well as addressing potential operational impacts. Consequently, this section of the RDEIR augments those deficient portions of the DEIR.

4.3.5 Methodology

All sensitive species and their habitats were evaluated for potential impacts from this project. DPR staff collected and reviewed existing available data to determine the proximity of sensitive plants, animals, and their habitats to the project area. Staff conducted a query of the California Department of Fish and Game's Natural Diversity Database (CNDDB 2010c) for the San Geronimo and all adjacent 7.5-minute USGS quadrangles. An official U. S. Fish and Wildlife Service (USFWS) species list for Marin

County was also reviewed. A list of special-status plant species potentially occurring in the area were derived from the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California (CNPS 2010) for the USGS quadrangles identified above.

Information on special-status species was obtained through discussions with California Department of Parks and Recreation (DPR) biologists, literature review, and on-site reconnaissance-level surveys. Multiple visits by DPR biologists were conducted to: survey and map for special status plants and to assess potential habitat for special status wildlife species.

4.3.6 Environmental Impacts, Project Requirements, and Mitigation Measures

Impact Statement BIO 1 (Wildlife Species): Would construction and/or operational activities associated with the proposed change in use project have a potential adverse effect, either directly or through habitat modification, on any species identified as a sensitive, candidate, or special status species in local or regional plans, policies, or regulations, or by the CDFG or the USFWS?

As noted in the DEIR, sensitive, candidate or special status species can potentially be found within the project vicinity. It should be noted that prior to the start of construction on all DPR projects having the potential for such species, a DPR-approved biologist must conduct training sessions for all project personnel. Instruction covers identification of sensitive wildlife species and their habitat, and specific measures required to protect and avoid sensitive wildlife. Training addresses general conservation measures, proper disposal and covering of trash and construction debris, and response to fluid spills.

Training materials are provided to construction personnel describing the federally listed northern spotted owl and California red legged frog, both of which are known to occur in the vicinity of the project. These materials consist of a laminated photo and short description of the species habitat and other pertinent information for onsite visual identification.

While the DEIR evaluated the impacts from construction-related activities it did not specifically address the potential operational impacts on these species. A change in use to allow for bicycles on Bills' Trail would have less than significant or no effects with project requirements on special status species identified in this document. Those species that reside in arboreal habitat and utilize flight as their primary means of locomotion would not come into contact with bicycle users. These species are the northern spotted owl, other raptors (except northern harrier), migratory birds, and bats. Although northern harriers will sometimes establish nests in dense grass, this habitat would not be affected by bicycle use; hence no effect on this species.

California freshwater shrimp, Tomales roach, steelhead, coho salmon, foothill yellow-legged frog are restricted to aquatic habitat that does not occur in terrain traversed by Bills' Trail. Potential indirect effects from release of sediment into nearby aquatic

habitat, such as Devil's Gulch, would be addressed by seasonal closure of the trail during the wet rainy season.

Marin blind harvestman and the Marin hesperian are restricted to terrestrial habitats that do not occur in terrain traversed by Bills' Trail and would not be affected by bicycle users.

There is potentially suitable non-breeding terrestrial habitat in the park unit for California red-legged frog; however, movement of individuals from breeding habitat into the park primarily occurs during the wet season when the trail would be subject to seasonal closure. In addition, frogs are active after nightfall when bicycle usage is non-existent.

Impact Statement BIO 4: Would the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

The proposed project would not interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors. Furthermore, the use of native wildlife nursery sites would not be affected by this project.

No barriers would be installed and no work would occur in the channels of any fish-bearing streams. Conversion of the existing Bills Trail for use by bicycles would not create permanent barriers to movement of resident or migrating wildlife utilizing native habitat bordering the trail and would not create a significant change from existing trail use.

While the goal is to completely avoid impacting species of concern as well as common beneficial plant and wildlife species, the threshold recognized by CEQA is to a "less than significant" level. As an example, transportation facilities are often constructed that later result in common animal species struck and killed by vehicles using those facilities, however; this is not a basis under CEQA for denying the project. This is not to say that DPR anticipates a higher animal mortality rate on the trail as a result of the change in use; only that a higher animal mortality rate in and of itself is not a justifiable rationale for not moving forward with the project. Consequently, the effects from project implementation are less than significant without project requirements.

4.3.8 Findings

Construction of the proposed project could result in potentially significant impacts, as identified in the DEIR, to the biological resources within the project area, which encompasses Bills' Trail and portions of Gravesite Fire Road in SPTSP. However, with integration of project requirements biological impacts would ensure impacts remain at a less than significant level.

4.8 Hydrology and Water Quality

This section contains an updated discussion of hydrology and water quality issues in light of the updated project description and analysis of the environmental effects. It includes a discussion of the Assessment of Erosion and Sediment Yield Impacts Related to Bills' Trail Modification and Use Conversion contained in the Clearwater Hydrology Report (June 23, 2009), and identifies standard and specific project requirements, mitigation measures and design features that will reduce the impacts to a less than significant level.

4.8.4 Environmental Impacts, Project Requirements, and Mitigation Measures

Methodology

The revised analysis of potential impacts caused by erosion and sedimentation contained in this RDEIR, is based on an Assessment of Erosion and Sediment Yield Impacts, prepared by Clearwater Hydrology (CH) on June 23, 2009, and attached as Appendix A.

Impact Statement HYDRO 5: Would the project substantially degrade water quality.

1. ***Erosion and soil loss will increase following completion of construction due to extent of disturbance to the trail bed and adjoining cut-slope for expansion of the trail prism –*** *DPR's proposed plan specifies the construction of a 4'-wide trail bed with an unspecified extent of cut-slope excavation. A narrower trail width, typically 2 to 3', but occasionally less, currently prevails over much of the trail length. These measured widths do not include the existing slough fans or the vegetated outer edges and/or minor fill berms. Fine sediments, representing up to 50% of the total soil volume, will be released during the excavation/expansion work and for the first year following construction; as fines are flushed from the surfaces and adjoining areas have yet to revegetate and provide buffering capacity.*

   Site-specific mitigations for minimizing sediment loss to steep slopes immediately adjacent to the Devil's Gulch channel or directly to tributary channels at trail crossings are necessary to minimize aquatic habitat impacts during this period.

While there will be disturbance to the trail by construction, there will be no expansion to the trail prism. It was originally constructed to a 4' width. Over the years, portions of the trail bed have narrowed with vegetation regrowth and some upper sections of the trail are essentially a single track trail. Once the slough on the inside hinge is removed and the trail tread brought back up to standard, the trail will be reconstructed back to its original 4' width. Components of the project including armoring ditchouts and rolling dips combined with **Standard Project Requirements GEO 1, BMPs, Geo 3, Revegetation Plan, Hydro 1, Erosion, Sediment Control and Pollution Prevention** and **Specific Project Requirements Hydro 2, Initial Trail Closure and Hydro 3, Seasonal Trail Closure** will insure that erosion and soil loss will remain at a less than

significant level. With implementation of specific and standard project requirements no mitigation measures would be required.

2. ***Erosion and soil loss due to ongoing use of the reconfigured trail will result in increased sediment yield to the Devil's Gulch channel and its tributaries.*** *After the trail has been reconfigured and immediate and short term, post-construction sediment has been transported downslope, trail segments will continue to experience increased soil loss relative to the existing condition. This is primarily due to widened trail track and the more continual removal of slough sediments from the cut-slope.*

   CH computed existing and post-project rates of soil loss for a portion of the steep (11.7%), lower trail segment fronting the main stem Devil's Gulch channel using the Universal Soil Loss Equation (USLE). The USLE was originally developed for farmland soil loss estimation by Wischmeier and Smith (1978), and was later adapted to construction sites and other contexts, Goldman (1986, 1991) presented regionalized maps and parameter values for application of the USLE to California, CH analyzed a 50' sub-segment of the selected 1,700' trail segment to incorporate the likely loss of water bars along this lengthy segment. The sub-segment soil loss total was then extrapolated over the longer 1,700' trail segment.

   The USLE analysis resulted in an estimated 34% increase in soil loss over the 1,700' trail segment due to the proposed trail conversion and widening. Similar computations could be made for the entire trail. Note also that this estimate only quantifies the potential soil loss from the reconfigured trail bed and not from incidental erosion of the cut-slope.

CH estimations of up to 34% post-construction soil loss is only valid were DPR not to incorporate design features and implement Project Requirements such as BMPs which are standard practice for DPR trail construction and rehabilitation projects. This Change in Use project has been designed with features to minimize sediment yield to Devil's Gulch and its tributaries. Reconstruction of the trail includes the following specific design components to minimize impacts:

- Provide outslope to the trail tread and removing any outer edge berm to facilitate sheet flow off the trail where it can be filtered by vegetation and organic litter;
- Remove lose-debris (slough) collecting on the inside hinge;
- Reconstruct existing switchbacks to provide design drainage as originally constructed;
- Construct rolling dips where feasible to collect water and direct it safely off the trail to prevent buildup of surface runoff subsequent erosion;
- Where rolling dips are infeasible, reconstruct failing water bars to divert water to controlled points along the trail and provide rock at the downslope end;
- Install armored rock crossings at all ephemeral drainages and micro drainages to harden the trail tread in areas of potential interface between trail users and natural topographic drainage features;

- Install gravel surfacing on trail areas in close proximity to Devil's Gulch to provide a stable tread surface as well at each bridge approach;
- Seasonally and at other times as necessary, close trails to all users when soils are saturated and softened by installing locking gates at each bridge crossing.
- Immediately following reconstruction, the trail would be closed for approximately 12 months to allow the soil and materials to settle and compact before the trail opens to the public. Routine maintenance will also be performed on the trail as necessary to reduce erosion to the extent possible and to repair weather-related damage that could contribute to erosion.

The project also incorporates measures to moderate rider behavior and minimize access (for all users) when conditions make the trails more susceptible to erosion and water quality impacts. They include:

- Install boulders and/or logs to create "pinch points" in approximately 100 locations to reduce downhill bicycle speed and increase the line of sight at curves. This creates an "S" path necessitating slower speeds to negotiate the path through the obstacles;
- Construct or repair barriers at switchbacks to discourage shortcuts and the creation of volunteer trails.

Finally, standard project requirements **GEO 1, BMPs, Geo 3, Revegetation Plan, Hydro 1, Erosion, Sediment Control and Pollution Prevention and s**pecific project requirements **Hydro 2, Initial Trail Closure and Hydro 3, Seasonal Trail Closure** and **Mitigation Measure AES 1 - Active Management and Maintenance,** will insure that erosion and soil loss will remain at a less than significant level.

3. ***Cut-slope sloughing and dry ravel will continue along the reconfigured inslope edge of the trail bed, and the potential concurrent use by hikers, bikers and equestrians will likely result in continual disturbance and loss of the slough material.*** *This could result in both the destabilization of the slough material, making it ready for detachment and mobilization by sheet runoff, and the loss of buttressing for the over-steepened cut-slope. Moreover, revegetation of the trail edges as occurs under existing use conditions will be highly unlikely. A negative feedback cycle could thus be established, producing an increase in erosion and sediment soil loss. This soil loss would yield increased sediment to Devil's Gulch and its tributary channels where downslope grades are steep and distances to drainageways are short.*

Standard project requirement **GEO 3 - Revegetation plan** will require revegetation of the cut-slopes where the underlying material is susceptible to sloughing, and on the fill-slopes to provide vegetation that will filter sediment runoff from the trail. Specific project requirement **HYDRO 1 – Initial Trail Closure** will insure that revegetation efforts have sufficient opportunity to establish and stabilize the slopes before traffic is permitted access to the trail.

4. ***Bike braking and acceleration in the approaches to bridge crossings in wet conditions could lead to excessive soil shearing, and the development of ruts***

that concentrate surface runoff during rainstorms. *Sediment-laden runoff in the vicinity of these bridge crossings has a short path to enter the forded tributary channels. These crossing approaches require targeted mitigation strategies that minimize the influx of sediment from the adjoining cut-slopes and provide well drained conditions.*

All bridge approaches will receive rock armoring or aggregate to reduce the amount of sediment that can enter the stream. The 100 pinch points will ensure that bicyclists cannot attain the speeds necessary that would necessitate hard braking. Finally, Specific **Project Requirement HYDRO 3, Seasonal Trail Closure**, will insure that trail use will not be possible by bicyclists or equestrians when trail conditions are unsuitable for riding.

5. ***Expanded mixed-use of the trail segment downslope of Bills' Trail linking it to Sir Francis Drake (SFD) would potentially cause significant increases in trail erosion and direct transport of sediment to the Devil's Gulch channel-*** *While this trail link has not been specified as part of the project, access to SFD would presumably be provided in some form. In some sub-segments of this trail reach, the outer edge of the trail bed is coincident with the top of the channel bank which is vertical or even over-steepened beyond vertical.*

Access to/from SFD is available via Devil's Gulch Fire Road. This trail segment is not a part of the project and will be posted as off-limits to bikes.

6. ***Outside of the more sensitive trail links fronting on the Devil's Gulch channel and its tributaries (near bridge or other channel crossings) noted above, the existing trail is positioned on benched or stepped upland slopes that accord substantial opportunities for deposition and are far removed from the Devil's Gulch channel-****Thus, these trail segments are more suitable for the increased volume of mixed-use traffic planned for the project.*

Although long-term operational impacts on runoff and water quality could be potentially significant, those impacts are mitigable to a less than significant level. With implementation of the following mitigation measures, in concert with mitigation measure **AES 1, Active Management and Maintenance,** standard project requirements **GEO 3, Revegetation Plan, and HYDRO 1, Erosion, Sediment Control and Pollution Prevention** will control soil erosion and surface water runoff and ensure no water quality standards are violated. These measures will result in a less than significant impact to water quality and waste discharge.

Level of Significance Before Mitigation:	Less Than Significant
Mitigation Measures:	None

4.8.6 Findings

For water quality evaluated as part of this RDEIR, the potential exists for significant degradation of water quality from erosion and sedimentation into Devil's Gulch and its

tributaries; however, with integration of project requirements, and mitigation the hydrologic and water quality impacts would be less than significant.

4.13 Transportation, Circulation, and Traffic

This section contains an analysis of the issue of potentially incompatible uses (mountain bikes and horses/hikers) and if these uses would substantially increase safety hazards.

4.13.1 Existing Conditions

Originally constructed with a 48" bench, sloughing on the inside hinge and narrowing of the tread with vegetation overgrowth the trail has narrowed the trail in places, particularly on the upper portion of the trail as it approaches Barnabe Peak. The trail features a series of 7 bridges, 10 switchbacks and numerous blind corners as it winds its way up the hill. The trail is currently duel use, limited to hikers and equestrian riders only.

4.13.5 Environmental Impacts, Project Requirements and Mitigation Measures

Impact Statement CIRC-4: Contain a design feature (e.g., sharp curves or a dangerous intersection) or incompatible uses (e.g., farm equipment) that would substantially increase hazards:

It is tempting to compare the existing multiuse trails at China Camp and Annadel State Parks, (where there have been reports of incidents between mountain bikers and other users), to safety concerns that could potentially occur on Bills' Trail with the change in use project. Certainly mountain bikes are capable of attaining speeds greater than that of hikers or equestrian riders and thus could be considered an incompatible use and safety hazard.

The trouble with that comparison is that these trails were constructed with no pinch points or other means to moderate user behavior. In contrast, Bills' Trail incorporates 100 of these design features that will force bike riders to slow before reaching switchbacks and blind corners where they are likely to have unexpected encounters with other users. Other improvements include widening the path to its original 48" width to facilitate safe passing; eliminating existing features, or avoid installing new features that could be utilized by riders as technical features to challenge the physical and mental skills of the rider.

The trail improvements have been designed to appeal to bike riders that, just like hikers and equestrians, will use the trail to appreciate the natural beauty that surrounds it.

Level of Significance Before Mitigation: Less Than Significant
Mitigation Measures: None

4.13.7 Findings

For safety concerns associated with potentially incompatible uses (mountain bikes and horses/hikers); integration of project requirements would ensure that impacts would remain at a less than significant level.

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6.0 SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

In accordance with CEQA Guidelines §15126.2, this DEIR identifies and analyzes the environmental effects of the proposed project and their significance, based on the physical conditions existing at and surrounding the proposed project location at the time the Notice of Preparation was published with the State Clearinghouse 2011032070, on March 30, 2011. Both direct and indirect potentially significant project-related effects are clearly described and the duration of these effects (long- or short-term) are noted. These include conditions specific to the proposed project area, physical changes, changes to ecological systems, human use and development of the land, public service demands, health and safety issues, and overall natural, cultural, and aesthetic impacts.

6.2 Environmental Effects Found to be No Impact

There was no potential for impacts to Land Use Planning (§4.9.1) [includes, Agriculture (§4.9.2), Minerals (§4.9.3), and Recreation (§4.9.4)]; Public Services (§4.11); Utilities (§4.12) or Growth Inducing/Cumulative (§5.0) [includes, Population, Employment, and Housing].

6.3 Environmental Effects Found to be Less Than Significant Impact

The following areas of potential environmental concern were found to have no potential for adverse impact or the potential for environmental impact was less than significant. “Significant” is defined in CEQA Guidelines §15382 as “...a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, greenhouse gases and climate change, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself would not be considered a significant effect on the environment. A social or economic change related to a physical change may be considered in determining whether the physical change is significant. “Additional information on existing conditions and basis for determining significance can be found in the referenced sections of this document.

The potential for significant adverse environmental impacts to Air Quality (§4.2), Biological Resources (§4.3), Green House Gases and Climate Change (§4,4),Cultural Resources (§4.5), Geology and Soils (§4.6), Hazards and Hazardous Materials (§4.7), Hydrology and Water Quality (§4.8), Noise (§4.10) and Transportation, Circulation, and Traffic (§4.13) was found to be less than significant.

6.4 Environmental Effects Found to be Significant

The proposed project was evaluated for potential significant adverse impacts to the natural environment. DPR determined that potentially significant impacts could result on Aesthetics and Visual Resources (§4.1). Integration of Mitigation Measure AES-1 Active Management and Maintenance would reduce potential project-related adverse impacts to less than significant level.

6.6 Overriding Consideration

This section addresses Section 15093 of the CEQA Guidelines requiring the public agency "to balance, as applicable, the economic, legal, social, technological, or other benefits of a proposed project against its unavoidable environmental risks when determining whether to approve the project. If the specific economic, legal, social, technological, or other benefits of a proposed project outweigh the unavoidable adverse environmental effects, the adverse environmental effects may be considered 'acceptable'" (14 CCR §15093). This is known as a statement of overriding considerations. This statement of overriding considerations could be made where changes or alterations in the Project that would avoid or substantially lessen the significant environmental effects are within the responsibility and jurisdiction of another public agency, or where specific economic, legal, social, technological or other considerations, which make mitigation measures or project alternatives infeasible.

The proposed project contains no impacts that cannot remain at or be reduced to a less than significant level. A Statement of Overriding Consideration is not necessary for the Trail Change in Use Project.

7.0 REPORT PREPARATION

Department of Parks and Recreation

Northern Service Center - Sacramento, California

Patricia DuMont, Staff Park and Recreation Specialist
Roy Martin, Environmental Scientist
Brad Michalk, Environmental Coordinator
Dan Osanna, State Historian III

Marin District – Petaluma, California

Roy McNamee, Staff Park and Recreation Specialist

Facilities

Karl Knapp, Staff Park and Recreation Specialist

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8.0 REFERENCES

Project Description

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Hydrology and Water Quality

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Appendix A
Clearwater Hydrology Report

CLEARWATER HYDROLOGY

Consultants in Hydrology and Water Resources

Watershed Management

Stream and Wetland Restoration

Wetland Delineation and Permit Acquisition

Stormwater Drainage and Flooding

2974 Adeline St.
Berkeley, CA 94703
Tel: 510 841 1836
Fax: 510 841 1610

June 23, 2009

Rachel Hooper, Esq.
Shute, Mihaly & Weinberger LLP
396 Hayes Street
San Francisco, CA 94102

RE: Erosion and Sediment Yield Impact Assessment for the Bill's Trail Use Conversion Project, Samuel P. Taylor State Park, Marin County, CA

Dear Ms. Hooper,

At your request, Clearwater Hydrology conducted the referenced impact assessment for Bill's Trail in Samuel P Taylor State Park. A location map of the Devil's Gulch and Bill's Trail area is presented in Figure 1. The California Department of Parks and Recreation (DPR) proposes to enact a use conversion project for Bill's Trail which would widen and/or reconstruct much of the trail and expand the existing single-use (hiking) to mountain biking and equestrian uses. The trail modification project was presented in a DPR memorandum, dated Jan. 25, 2008 and in DPR's Project Evaluation Form. Attachments to these documents included a *Change in Use Survey, Trail Matrix Classification*, and *Trail Log*, as well as portions of DPR's *Trail Project Implementation and Best Management Protocols*. In a filing with the State Clearinghouse in May 2009, DPR submitted a Notice of Exemption for the proposed trail modifications project under the title of "Bill's Trail Modifications".

The present erosion and sediment yield impact assessment seeks to determine whether the proposed trail modifications could have a detectable impact on sediment yield to Devil's Gulch and Lagunitas Creek. Both of these creeks provide critical habitat for federally-listed, steelhead trout (*Onocorhynchus mykiss irideus*) and coho salmon (*Oncorhynchus kisutch*). Fine sediment control is a principal objective of the Lagunitas Creek Fisheries Management Plan (see www.marinwater.org/documents/) and its allied Sediment and Riparian Management Plan (Prunuske-Chatham 1997), prepared by the Marin Municipal Water District (MMWD), under the mandate of the California State Water Resources Control Board (SWRCB Order WR 95-17). Since the proposed trail modifications include extensive excavation (for widening), spoil reconfiguration (outsloping) and recompaction, and other constructed features (e.g. drainage dips, water bars, and structural pinch points), as well as the expansion in user groups, substantial opportunities exist for project-related increases in erosion and sediment yield. The precise extent and potential significance of such increases would only become evident with a more detailed investigation of the specific construction features and methods. Thus, the current assessment is necessarily cursory due to the lack of specific design information for the trail modifications. Given the potential for erosion in a critical habitat area, it is our recommendation that DPR perform a thorough analysis of this issue prior to approving the project.

The present assessment consisted of a field reconnaissance of the approximately 3.75-mile trail, a review of pertinent technical literature, and a comparative analytical assessment of estimated soil loss for a selected trail segment adjoining the Devil's Gulch channel. Field notes and photo-documentation supplemented measurements of trail widths and slopes and trail-to-stream distances made using tapes, a hand level and scaled maps (USGS, Google Earth, and DPR).

Local Physiography and Slope Processes

Bill's Trail traverses primarily north-facing, upland slopes within the Devil's Gulch Watershed. Trail elevations range from roughly 200 ft. at the Devil's Gulch bridge crossing to 1,200 ft. at the Barnabe Fire Trail junction, just below Barnabe Peak. Trail grades range from nearly level to 11 percent, with the steepest segment occurring closest to the Devil's Gulch channel bed at a downslope distance of as little as 10-15 feet. Steep first and second order creeks draining similarly steep, forested slopes deliver sediment and debris to Devil's Gulch, which is aligned southwest-northeast. The trail alignment initially parallels the nearly vertical to vertical canyon walls formed by the main stem channel incision, and then turns gradually eastward and further from the channel. Once the trail begins a series of switchbacks, it is several hundred feet from the Devil's Gulch channel (Figure 2). Note that the reproduced DPR figure distorts the channel to trail distances and is therefore considered approximate.

The trail crosses two of Devil's Gulch's perennial tributaries numerous times, at designated bridge crossings Nos. 1-7. In addition, stabilized tributary crossings occur where perennial flow is absent. At these ephemeral channel crossings, log and rock cribbing structures have been installed to allow subsurface drainage and maintain drier track conditions. Since upslope sediment has buried the upstream face of the structures, it is likely that sediment and debris-laden flow does occasionally flow over the trail surface during higher intensity rainstorms. There was no evidence of recent trail overflows at these locations during the June field inspection.

The upland physiography, or landscape, is composed of the incised, lower order stream channels and intervening, often pronounced, secondary ridges and smaller spur ridges separating these streams. Topographic hollows or swales are often located upslope of the headwaters of many low order streams. Swales are often the sources of rapidly moving debris-flows during periods of prolonged rainfall, and they can be a major source of stream sediment and debris.

Large to small topographic benches or steppes of flatter gradient are scattered throughout the uplands of the Devil's Gulch Watershed. One significant bench occurs alongside the main stem channel, opposite a point 2,000 ft. or so upslope of the trailhead, occupying a stream terrace on the inside of a meander. The bench thins out in the upstream direction as the channel meander moves to the southern edge of the canyon. The benches or steppes located on the steeper mid-slopes of hillsides are typically of landslide origin.

Ongoing, erosive slope processes of variable rates (both temporally and spatially) are responsible for the development of the upland physiography and these processes also transport derived sediment to the upland channels (lower order streams). The lower order tributaries are often storage sites for upslope sediment. Delivery to the main stem channel occurs episodically in response to less frequent, more intense runoff-producing rainstorms and debris flows. In addition to slumps, earthflows, combined slumps-earthflows, and debris-flows, sediment moves downslope in response to downslope creep, overland sheet-wash, rutting-rilling, and, within the stream channels, gully head advancement and bank slumping.

In their dormant or suspended state of inactivity, such landslide features, particularly large, old, flatter slumps, become storage areas for sediment eroded from above by both natural erosion and trail/road-induced erosion. Broader, convex ridges are also common storage areas for eroded trail and hillslope sediments. Sediment stored in hillslope depositional zones may not reach stream channels for hundreds to thousands of years. However, eroded hillslope or trail sediment that is transported downslope for short distances to tributary or main stem channels may reach receiving waters in the course of a single storm event.

Trail Soil and Bedrock Characteristics

Figure 3 is a soil unit map that shows the soils present in the portion of the Devil's Gulch Watershed traversed by Bill's Trail (Web Soil Survey 2.2, National Cooperative Soil Survey). A single soil unit classified as Dipsea- Barnabe very gravelly loams, 50-75% slopes, underlies the entire trail alignment. These soils are derived from sandstone bedrock residuum, which is readily observable both on the trail cut-slopes and occasionally on the trail bed. The majority Dipsea unit occurs primarily on north- and east-facing hillslopes and in moist drainageways, while the Barnabe unit is found on ridges and convex slopes. Both soil units are characterized as well-drained with low available water capacity, and exhibit rapid runoff potential and a very high erosion hazard (USDA 1985). The Dipsea soils are typically 40 inches thick, while the Barnabe soils are shallow at 10-20 inches in thickness. For both of the component soils, the Soil Survey lists fine-grain percentages, including medium to fine sands, silts and clays (i.e. passing No. 40 sieve) ranging from approximately 25-50 percent.

The sandstone bedrock that outcrops along Bill's Trail is typically highly weathered, as shown in several photos in the photo appendix. Some outcrops are more resistant, where the surrounding decomposing material has been preferentially eroded. However, the bulk of the exposed material has decomposed to smaller fragments and gravel, embedded in a fine-grained matrix of sand and silt, with some clay. Both the upper profile soil and this bedrock residuum are readily erodible by hydraulic or mechanical forces when forming a trailside cut-slope.

Field Observations of Erosion Sources and Processes

CH Principal, William Vandivere, P.E., and staff environmental engineer, Margaret McKeon hiked the entire length of Bill's Trail on June 18, 2009. The principal erosion source areas and processes related to trail construction and use were determined to be:

- Localized slump failures along the nearly vertical trail cut-banks- These slump failures occur continuously along the steeper and higher cut-faces, particularly along the initial, steep segment of the trail and in the vicinity of tributary channel crossings. The slump material forms small fan deposits along the inslope edge of the trail, typically 1-1.5 ft.-high, at the angle of repose for the eroded material. At this toe of slope position, the deposits sometimes revegetate, lending rooting stability and buttressing the lower cut-slope.

- Longer, steep trail segments with unbroken slopes- While there are minor, short segments of trail further upslope in the vicinity of the switchback turns, the highest potential for trail erosion and sediment yield occurs over the lowest roughly 1,700 ft. of the trail where the channel slope was measured at 11.7 percent and the slope is essentially unbroken. No rilling or rutting was noted along the segment due to minor outsloping, however, the trail edge is coincident with the top of the ascending high bank of the Devil's Gulch channel. Thus, the sediment delivery ratio- the portion of eroded soil that actually reaches a channel- is close to 1.0, or 100%, denoting certain delivery of eroded sediment to the channel.

- Tributary channel crossings either bridged or stabilized- Channel crossings necessarily locate trail segments immediately adjacent to short, steep channel banks. Although in some cases, sediment may be stored in the receiving channel for some time prior to being conveyed further downstream to Devil's Gulch, the efficiency in sediment delivery to the active tributary channel is high.

- Access trail segment downslope of Bill's Trail- The trail modifications noted in the DPR documentation make no specific mention of the ultimate trail linkage with Sir Francis Drake. If the existing lower trail segment atop the bank of Devil's Gulch is used for this linkage, it will represent a ready source area for sediment yielded to the Devil's Gulch channel. Along portions of this segment, the edge of the existing trail is coincident with the top of vertical bank of the channel.

Assessment of Erosion and Sediment Yield Impacts Related to Bill's Trail Modifications and Use Conversion

Based on the June 2009 field reconnaissance, review of the documentation provided by DPR describing the trail modification and use conversion project, and simple CH computations of soil loss from the steep, lower segment of Bill's Trail, the findings of the erosion and sediment yield assessment yielded the following findings/conclusions:

1) Erosion and soil loss will increase following completion of construction due to the extent of disturbance to the trail bed and adjoining cut-slope for expansion of the trail prism- The DPR plan specifies the construction of a 4 ft.-wide trail bed with an unspecified extent of cut-slope excavation. A narrower trail width, typically 2-3 feet, but occasionally less, currently prevails over much of the trail length. These measured widths do not include the existing slough fans or the vegetated outer edges and/or minor fill berms. Fine sediments, representing up to 50% of the total soil volume, will be released during the excavation/expansion work and for the first year following construction; as fines are flushed from the surfaces, and adjoining areas have yet to revegetate and provide buffering capacity.

   Site-specific mitigations for minimizing sediment loss to steep slopes immediately adjacent to the Devil's Gulch channel or directly to tributary channels at trail crossings are necessary to minimize aquatic habitat impacts during this period.

2) Erosion and soil loss due to ongoing use of the reconfigured trail will result in increased sediment yield to the Devil's Gulch channel and its tributaries- After the trail has been reconfigured and immediate and short term, post-construction sediment has been transported downslope, trail segments will continue to experience increased soil loss relative to the existing condition. This is primarily due to the widened trail track and the more continual removal of sloughed sediments from the cut-slope.

   CH computed existing and post-project rates of soil loss for a portion of the steep (11.7%), lower trail segment fronting the main stem Devil's Gulch channel using the Universal Soil Loss Equation (USLE). The USLE was originally developed for farmland soil loss estimation by Wischmeier and Smith (1978), and was later adapted to construction sites and other contexts. Goldman (1986, 1991) presented regionalized maps and parameter values for application of the USLE to California. The equation, its parameter values, and supporting maps and tables are presented in Appendix B, which also includes a spreadsheet table showing the results of the analysis. CH analyzed a 50-ft. sub-segment of the selected 1,700 ft. trail segment to incorporate the likely use of water bars along this lengthy segment. The sub-segment soil loss total was then extrapolated over the longer 1,700 ft. trail segment.

   The USLE analysis resulted in an estimated 34 percent increase in soil loss over the 1,700 ft. trail segment due to the proposed trail conversion and widening. Similar computations could be made for the entire trail. Note also that this estimate only quantifies the potential soil loss from the reconfigured trail bed and not from incidental erosion of the cut-slope.

3) Cut-slope sloughing and dry ravel will continue along the reconfigured inslope edge of the trail bed, and the potential concurrent use by hikers, bikers and equestrians will likely result in continual disturbance and loss of the slough material- This could result in both the destabilization of the slough material, making it ready for detachment and mobilization by sheet runoff, and the loss of buttressing for the oversteepened cut-slope. Moreover, revegetation of the trail edges, as occurs under existing use conditions, will be highly unlikely. A negative feedback cycle could thus be established, producing an increase in erosion and sediment soil loss. This soil loss would yield increased sediment to Devil's Gulch and its tributary channels where downslope grades are steep and distances to drainageways are short.

4) Bike breaking and acceleration in the approaches to bridge crossings in wet conditions could lead to excessive soil shearing, and the development of ruts that concentrate surface runoff during rainstorms- Sediment-laden runoff in the vicinity of these bridge crossings has a short path to enter the forded tributary channels. These crossing approaches require targeted mitigation strategies that minimize the influx of sediment from the adjoining cut-slopes and provide well-drained conditions.

5) Expanded mixed-use of the trail segment downslope of Bill's Trail linking it to Sir Francis Drake (SFD) would potentially cause significant increases in trail erosion and direct transport of sediment to the Devil's Gulch channel- While this trail link has not been specified as part of the project, access to SFD would presumably be provided in some form. In some sub-segments of this trail reach, the outer edge of the trail bed is coincident with the top of the channel bank, which is vertical or even oversteepened beyond vertical.

6) Outside of the more sensitive trail links fronting on the Devil's Gulch channel and its tributaries (near bridge or other channel crossings) noted above, the existing trail is positioned on benched or stepped upland slopes that accord substantial opportunities for deposition and are far removed from the Devil's Gulch channel- Thus, these trail segments are more suitable for the increased volume of mixed-use traffic planned for the project.

Given the demonstrated potential for increased erosion and soil loss in a critical habitat area, it is our recommendation that DPR perform a thorough analysis of this issue prior to approving the project. We trust that this assessment will assist DPR and other interested parties in their evaluation of the Bill's Trail project and the submitted Notice of Exemption.

Yours truly,

William Vandivere, P.E.
Principal

Margaret McKeon, M.S.
Environmental Engineer

Attachments:

Appendix A: Photo-Documentation: CH Field Reconnaissance, June 2009

Appendix B: Soil Loss Estimates for Pre- and Post-Project Trail Conditions-Selected Near-Channel Reach

Appendix C: Supplemental Technical Data

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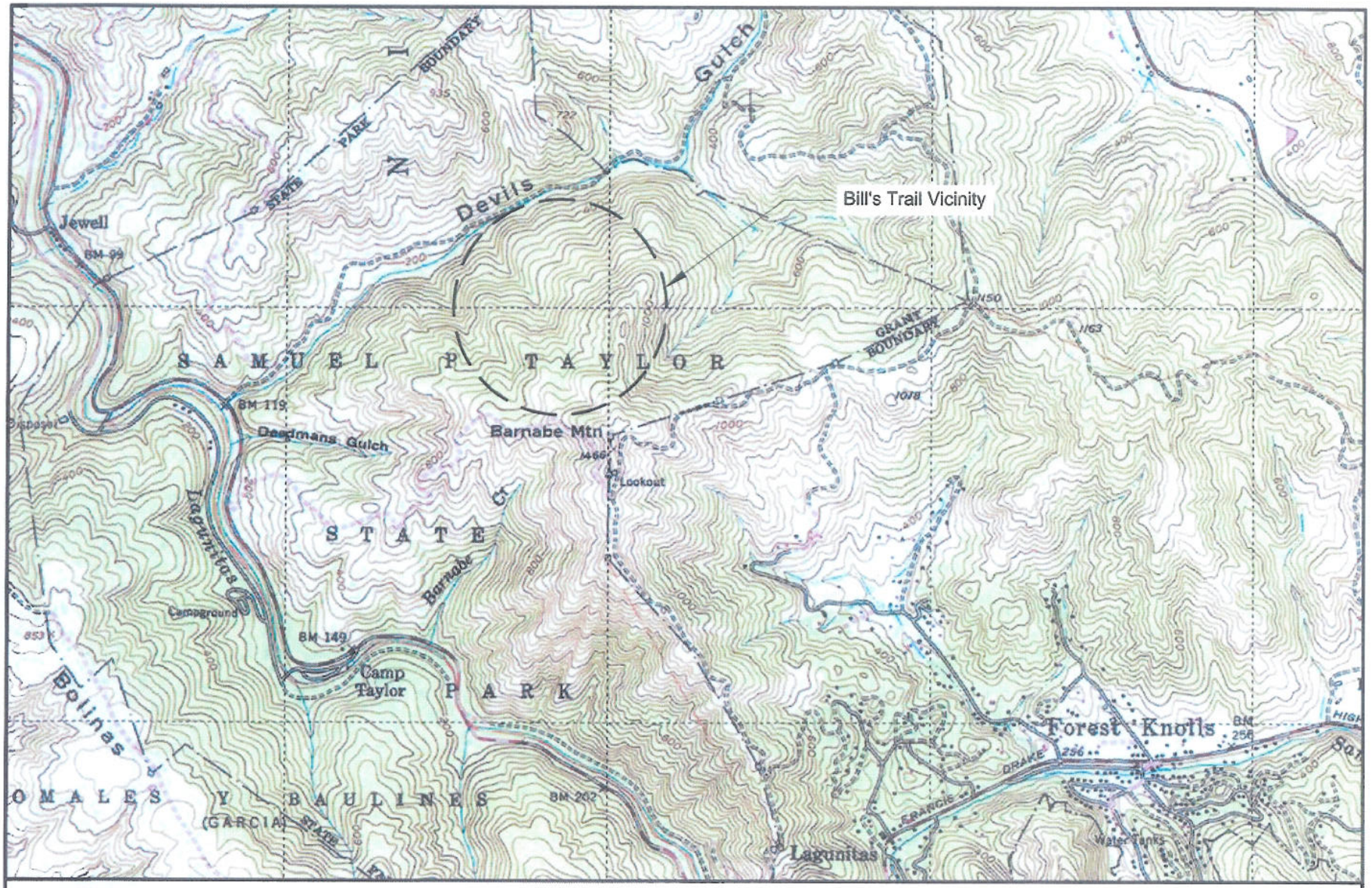
APPENDICES

APPENDIX A:
Photo-Documentation:
CH Field Reconnaissance, June 2009

APPENDIX B:
Soil Loss Estimates for
Pre- and Post-Project Trail Conditions:
Selected Near-Channel Reach



CLEARWATER HYDROLOGY

2000 1000 0 2000

Scale in Feet

N

Figure 1 - Samuel P. Taylor State Park Regional Map

Project: Bill's Trail Improvement - Sediment Impact Appraisal
Date: 6/19/09

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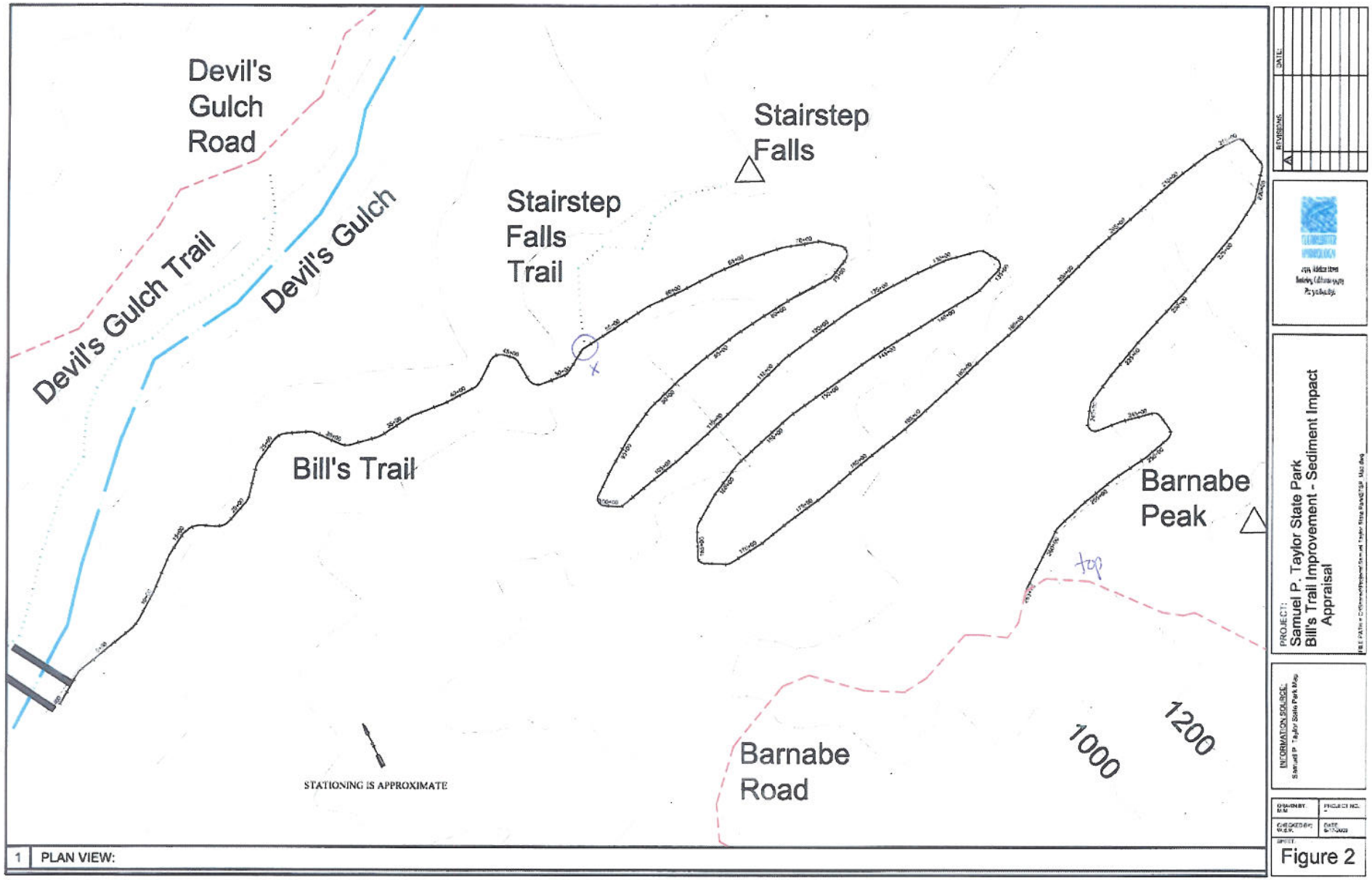
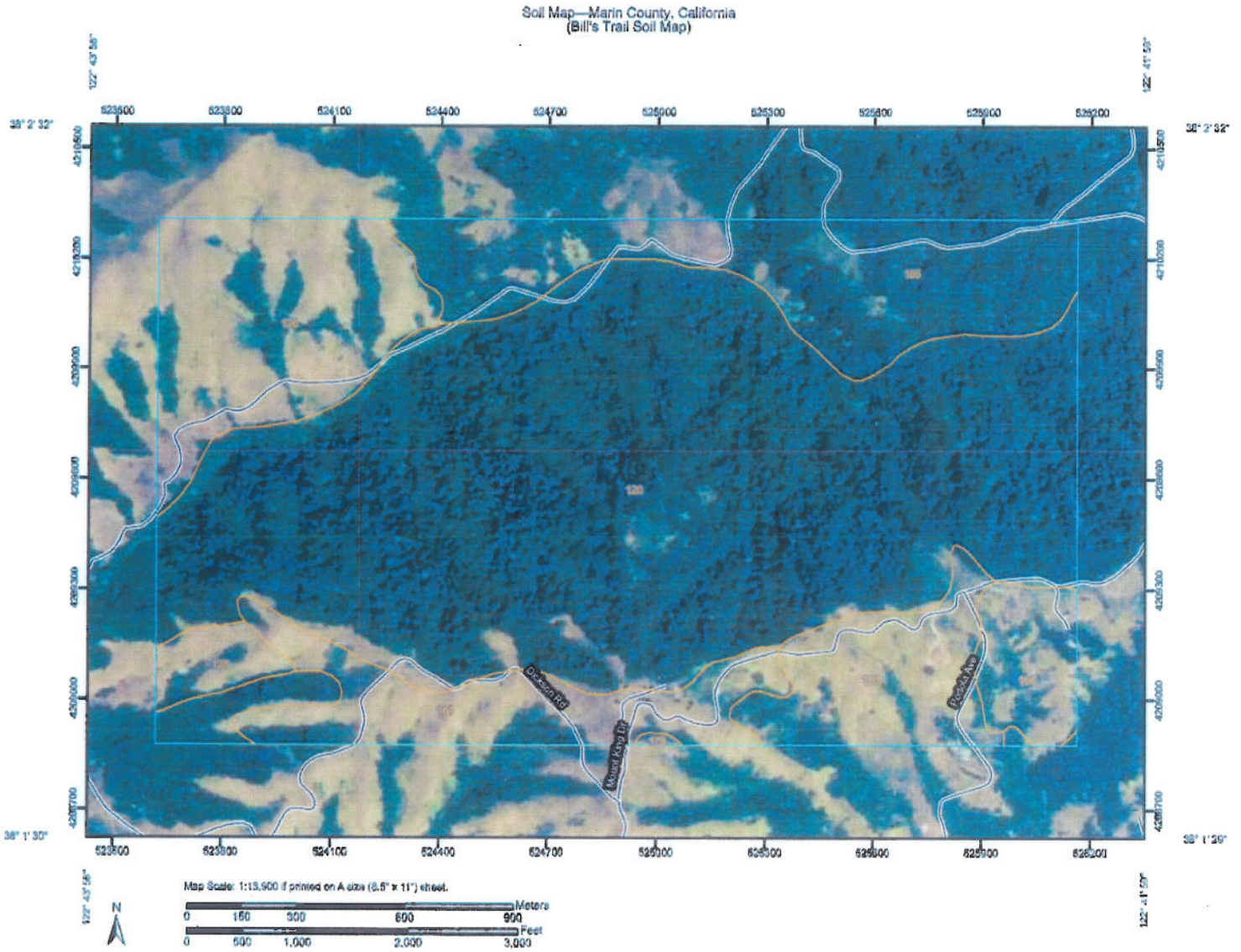


bridge

very diff trail from what is in PEF (brochure pic)

Roy to get trail GPS'd



CLEARWATER HYDROLOGY

Figure 3 - Samuel P. Taylor State Park Soil Map

Project: Bill's Trail Improvement - Sediment Impact Appraisal
Date: 6/19/09

FILE PATH = C:\Shared\Projects\Samuel Taylor State Park\STSP_Map.dwg

Photo 1. View of the head of Bill's Trail and bridge spanning Devil's Gulch. The trail is approximately 3 ft. wide and within 6 ft. of the creekbed (photo right).

Photo 2. Example of concentrated runoff on the upslope side of Bill's Trail causing a minor slump and sediment deposition at the toe of the bank.

Photo 3. Downslope extension of slump in Photo 2. The evidence of concentrated runoff ends near the tree where most of the remaining sediment is likely deposited.

Photo 4. Example of frequent exposure of sandstone in steep upslope banks. Exposed sandstone is common along the upslope bank. It is weathered and yields gravel-sized sediment.

Photo 5. Example of nearly vertical and unvegetated upslope banks common on the upslope edge of steeper segments of Bill's Trail. Note the fine-grained, upper soil profile, overlapping the weathered sandstone residuum.

Photo 6. View of bench between the toe of the slope and Devil's Gulch. This bench will likely trap most sediment from the section of Bill's Trail between Sta. 30+00 and 35+00.

Photo 7. Photo of cut logs placed on the downslope edge of Bill's Trail, probably resulting from the clearing of fallen trees. Note the fine sediment yielded from the trail track that has been deposited between the offset logs.

Photo 8. Another example of near vertical, unvegetated banks on the cut-slope along Bill's Trail.

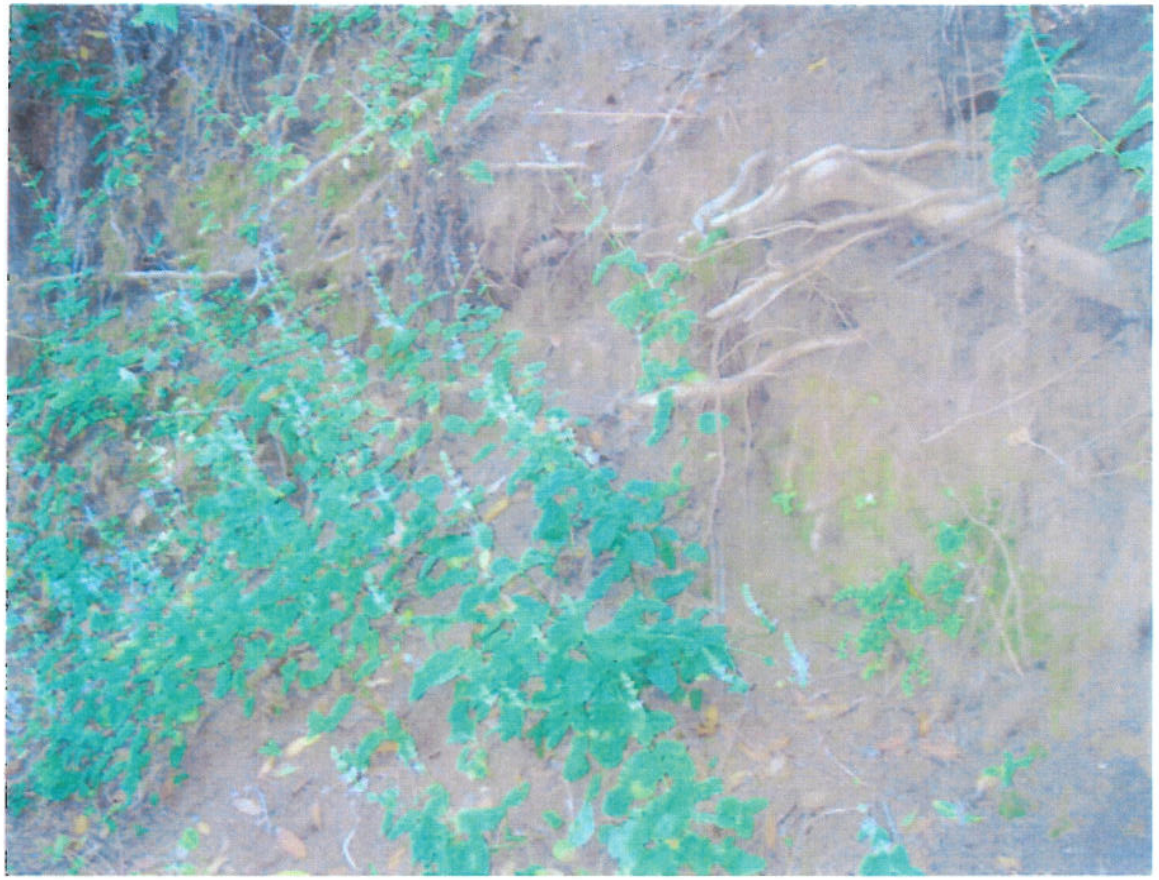


Photo 9. View of a typical alluvial fan (beneath flowers) formed along the toe of the upslope cut bank. Such fans are created by the action of upslope sheet flow, burrowing animals, and/or groundwater seepage. Under current conditions, portions of these fan deposits are vegetated, and both buttress the toe of the upper banks and reduce track soil loss.

Photo 10. View of narrow section of trail. Width shown is approximate 1-1.5' in width. This area would require significant widening.

Photo 11. View of Bridge #5. Widening the trail through this turn may be difficult.

Photo 12. Close-up view of Bridge #5. The supports are being scoured and exposed.

Photo 13. View of Bridge #6. The trail width is roughly 4 ft. here, compared to the narrower approaches at Bridge #5.

Photo 14. View of Barnabe Road looking upslope from Bill's Trail. The rut (photo left) continues for approximately 60-80 ft. up a steep section of the road (about 22% slope).

Table B1: USLE-Based Soil Loss Estimates For Bill's Trail Pre- and Post- Project Conditions for Bill's Trail Lower Segment Adjacent to Devil's Gulch Bridge Crossing

USLE:	A = R x K x LS x C x P					
	where	A =	soil loss		tons/acre/year	
		R =	rainfall erosion index		(100ft.)(tons/acre)(in/hr)	
		K =	soil erodibility factor		(tons/acres)/(unit R)	
		LS =	slope length and steepness factor		dimensionless	
		C =	vegetative cover factor		dimensionless	
		P =	erosion control practice factor		dimensionless	
	- Total Length of lower 11.7% slope trail segment = 1,700 ft.					
	- Assume DPR water bar installation @ 50 ft. intervals, so use slope length = 50 ft.					
R Factor						
	From Figure 5-5	(Goldman, SJ 1991)				
		R = 75.0	(100ft.)(tons/acre)(in/hr)			
K Factor						
	"Whole-soil" value from WebSoil Survey					
		K = 0.1				
LS Factor						
	From AutoCaD:					
		slope = 0.117				
	From Table 5.5	(Goldman, ibid.)				
		LS =	(65.41 x S^2/(s^2+10,000) + 4.46 x S/(s^2 +10,000)^0.5 + 0.065)(L/72.5)^m			
			S =	11.7	slope steepness (%)	
			L =	50	slope length (ft)	
			m =	0.5	0.5 (for slopes >5%)	
		LS = 1.2				

C Factor				
	From Table 5.6	(Goldman, ibid.)		
	C = 1.0	No cover since trail is un-vegetated.		
P Factor				
	From Table 5.7	(Goldman, ibid.)		
	P = 1.3	Trail is compacted and smooth		
Soil Loss Per Acre Per Year				
	A = 11.9	tons/acre/year		
Existing Area of Trail				
	Length =	50	ft	
	Width =	3	ft	
	Area =	150	sq.-ft.	
		0.003	acres	
Proposed Area of Trail				
	Length =	50	ft	
	Width =	4	ft	
	Area =	200	sq.-ft.	
		0.005	acres	

Conclusion	
	Soil Loss (tons/year) for 50-ft. sub-segment
Existing Trail	0.041
Proposed Trail	0.055
	Soil loss for entire 1,700-ft. segment
Existing Trail	1.390
Proposed Trail	1.854
	Increase in soil loss
50-ft. Segment	34.1%
1,700-ft. Segment	33.3%

EROSION CONTROL AND LAND RESTORATION
COURSE HANDOUT

Prepared for:

U.C. Berkeley Extension
September 27, 1991

by

Steven J. Goldman

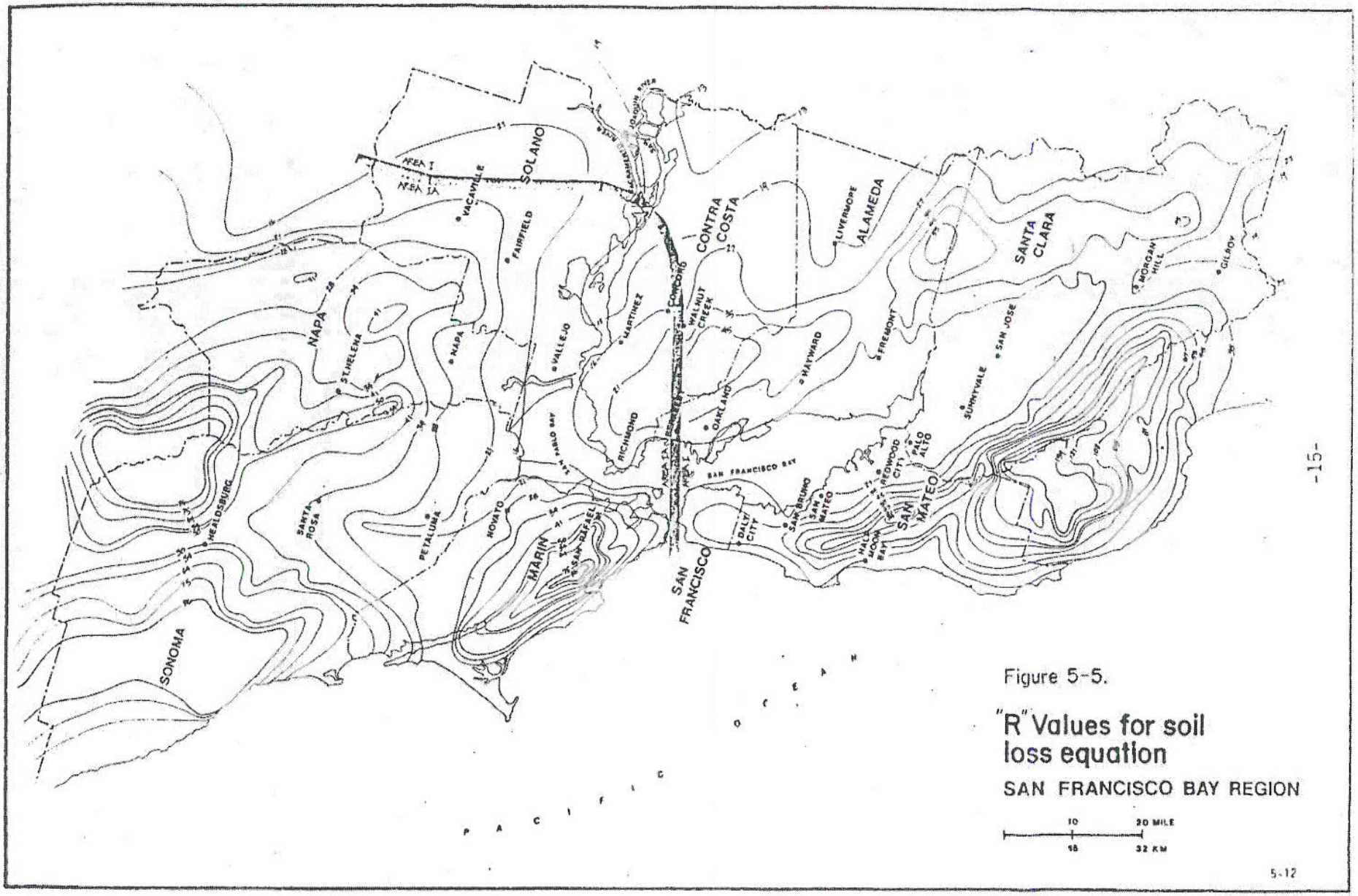


Figure 5-5.

"R" Values for soil loss equation

SAN FRANCISCO BAY REGION

5-12

5.2c Soil Erodibility Factor K

The soil erodibility factor K is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. Texture is the principal factor affecting K, but structure, organic matter, and permeability also contribute. K values range from 0.02 to 0.69.

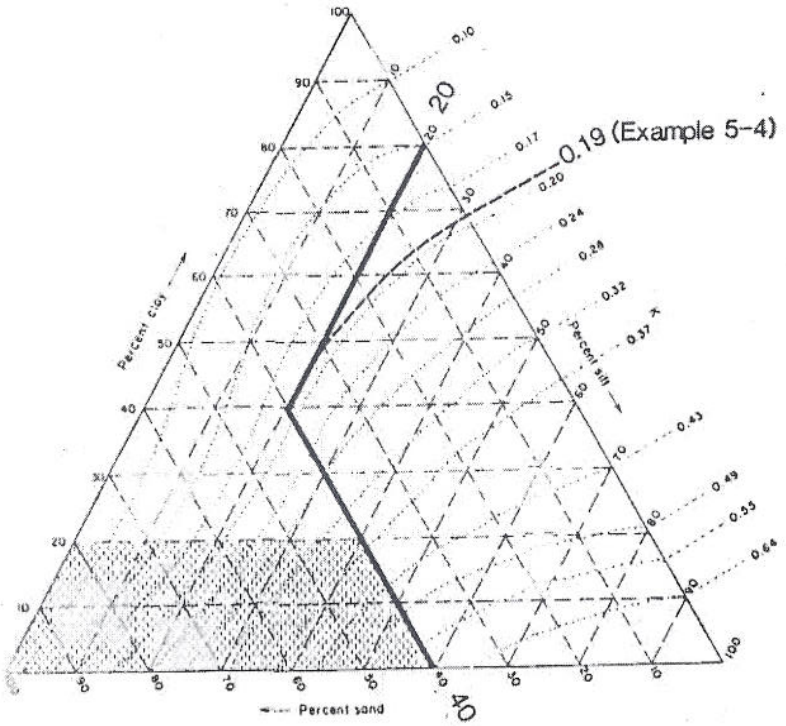


Fig. 5.6 Triangular nomograph for estimating K value. (6) See Table 5.3 for adjustments to K value under certain conditions.

EXAMPLE 5.4

Given: A soil with the following particle size distribution.

Component	Size, mm	Fraction, %
Sand	2.0–0.1	30
Very fine sand	0.1–0.05	10
Silt	0.05–0.002	20
Clay	Less than 0.002	40

Find: Texture and K value.

Solution: Entering Fig. 5.1 with 40 percent total sand and 20 percent silt, the texture is found to be on the border between clay and clay loam. Entering Fig. 5.6 with the same percents (see bold lines), the K value is found to be 0.19.

TABLE 5.6 C Values for Soil Loss Equation*

Type of cover	C factor	Soil loss reduction, %
None	1.0	0
Native vegetation (undisturbed)	0.01	99
Temporary seedings:		
90% cover, annual grasses, no mulch	0.1	90
Wood fiber mulch, ¼ ton/acre (1.7 t/ha), with seed†	0.5	50
Excelsior mat, jute†	0.3	70
Straw mulch†		
1.5 tons/acre (3.4 t/ha), tacked down	0.2	80
4 tons/acre (9.0 t/ha), tacked down	0.05	95

*Adapted from Refs. 11, 15, and 20

†For slopes up to 2:1.

TABLE 5.7 P Factors for Construction Sites (Adapted from Ref. 15)

Surface condition	P value
Compacted and smooth	1.3
Trackwalked along contour*	1.2
Trackwalked up and down slope†	0.9
Punched straw	0.9
Rough, irregular cut	0.9
Loose to 12-in (30-cm) depth	0.8

*Tread marks oriented up and down slope.

†Tread marks oriented parallel to contours, as in Figs. 6.9 and 6.10.

TABLE 5.5 (LS Values) (10)

Slope ratio	Slope gradient, %	LS values for following slope lengths *l*, ft (m)									
		10 (3.0)	20 (6.1)	30 (9.1)	40 (12.2)	50 (15.2)	60 (18.3)	70 (21.3)	80 (24.4)	90 (27.4)	100 (30.5)
	0.5	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.10
100:1	1	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.12	0.12
	2	0.10	0.12	0.14	0.15	0.16	0.17	0.18	0.19	0.19	0.20
	3	0.14	0.18	0.20	0.22	0.23	0.25	0.26	0.27	0.28	0.29
	4	0.16	0.21	0.25	0.28	0.30	0.33	0.35	0.37	0.38	0.40
20:1	5	0.17	0.24	0.29	0.34	0.38	0.41	0.45	0.48	0.51	0.53
	6	0.21	0.30	0.37	0.43	0.48	0.52	0.56	0.60	0.64	0.67
	7	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82
12½:1	8	0.31	0.44	0.54	0.63	0.70	0.77	0.83	0.89	0.94	0.99
	9	0.37	0.52	0.64	0.74	0.83	0.91	0.98	1.05	1.11	1.17
10:1	10	0.43	0.61	0.75	0.87	0.97	1.06	1.15	1.22	1.30	1.37
	11	0.50	0.71	0.86	1.00	1.12	1.22	1.32	1.41	1.50	1.58
8:1	12.5	0.61	0.86	1.05	1.22	1.36	1.49	1.61	1.72	1.82	1.92
	15	0.81	1.14	1.40	1.62	1.81	1.98	2.14	2.29	2.43	2.56
6:1	16.7	0.96	1.36	1.67	1.92	2.15	2.36	2.54	2.72	2.88	3.04
5:1	20	1.29	1.82	2.23	2.58	2.88	3.16	3.41	3.65	3.87	4.08
4½:1	22	1.51	2.13	2.61	3.02	3.37	3.69	3.99	4.27	4.53	4.77
4:1	25	1.86	2.63	3.23	3.73	4.16	4.56	4.93	5.27	5.59	5.89
	30	2.51	3.56	4.36	5.03	5.62	6.16	6.65	7.11	7.54	7.95
3:1	33.3	2.98	4.22	5.17	5.96	6.67	7.30	7.89	8.43	8.95	9.43
	35	3.23	4.57	5.60	6.46	7.23	7.92	8.55	9.14	9.70	10.22
2½:1	40	4.00	5.66	6.93	8.00	8.95	9.80	10.59	11.32	12.00	12.65
	45	4.81	6.80	8.33	9.61	10.75	11.77	12.72	13.60	14.42	15.20
2:1	50	5.64	7.97	9.76	11.27	12.60	13.81	14.91	15.94	16.91	17.82
	55	6.48	9.16	11.22	12.96	14.48	15.87	17.14	18.32	19.43	20.48
1¾:1	57	6.82	9.64	11.80	13.63	15.24	16.69	18.03	19.28	20.45	21.55
	60	7.32	10.35	12.68	14.64	16.37	17.93	19.37	20.71	21.96	23.15
1½:1	66.7	8.44	11.93	14.61	16.88	18.87	20.67	22.32	23.87	25.31	26.68
	70	8.98	12.70	15.55	17.96	20.08	21.99	23.75	25.39	26.93	28.39
	75	9.78	13.83	16.94	19.56	21.87	23.95	25.87	27.66	29.34	30.92
1¼:1	80	10.55	14.93	18.28	21.11	23.60	25.85	27.93	29.85	31.66	33.38
	85	11.30	15.98	19.58	22.61	25.27	27.69	29.90	31.97	33.91	35.74
	90	12.02	17.00	20.82	24.04	26.88	29.44	31.80	34.00	36.06	38.01
	95	12.71	17.97	22.01	25.41	28.41	31.12	33.62	35.94	38.12	40.18
1:1	100	13.36	18.89	23.14	26.72	29.87	32.72	35.34	37.78	40.08	42.24

*Calculated from

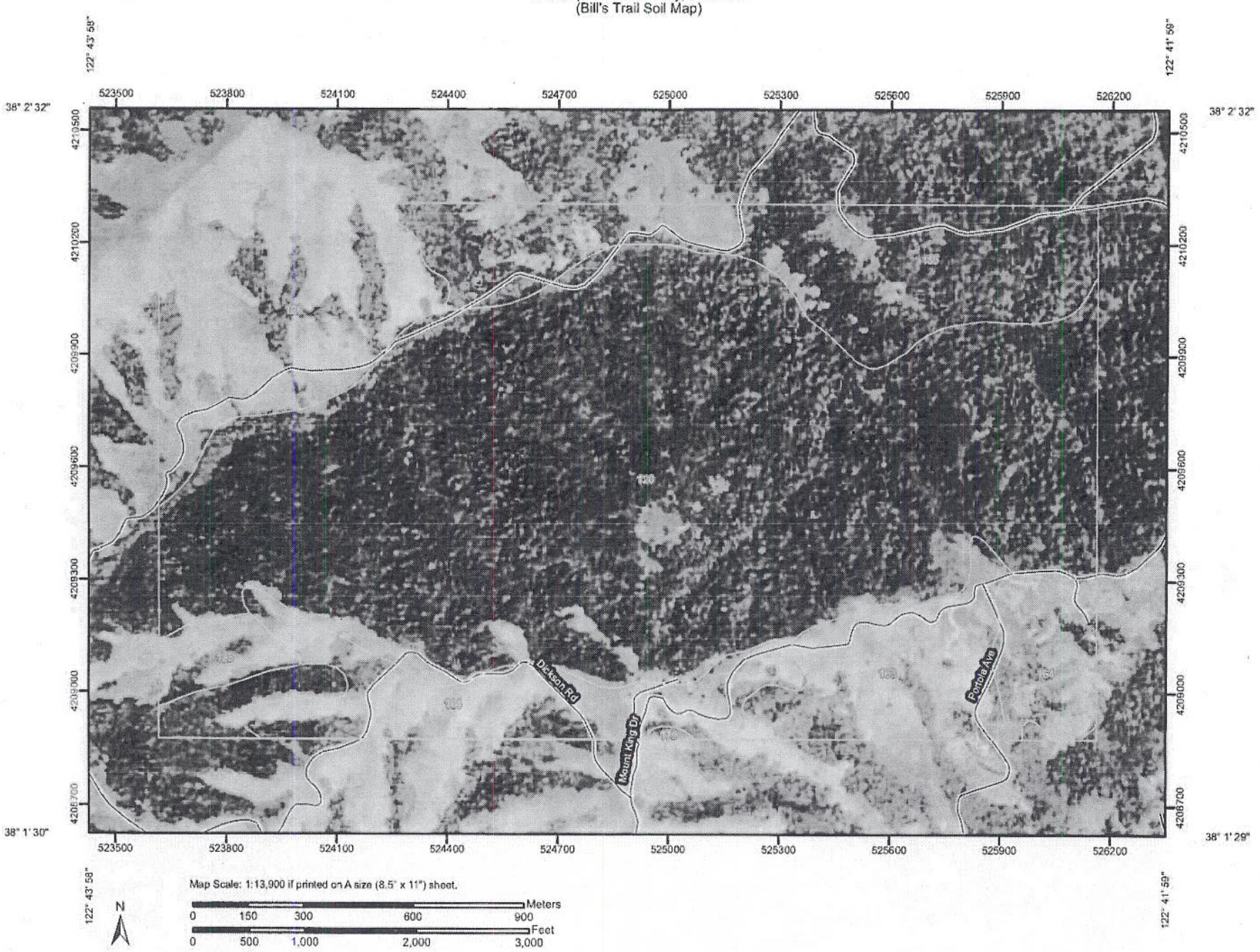
$$LS = \left(\frac{65.41 \times s^2}{s^2 + 10{,}000}\right) + \left(\frac{4.56 \times s}{\sqrt{s^2 + 10{,}000}}\right) + 0.065\left)\left(\frac{l}{72.5}\right)^m$$

LS = topographic factor
l = slope length, ft (m × 0.3048)
s = slope steepness,
m = exponent dependent upon slope steepness
(0.2 for slopes < 1%, 0.3 for slopes 1 to 3%
0.4 for slopes 3.5 to 4.5%, and
0.5 for slopes ≥ 5%)

LS values for following slope lengths *l*, ft (m)												
150 (46)	200 (61)	250 (76)	300 (91)	350 (107)	400 (122)	450 (137)	500 (152)	600 (183)	700 (213)	800 (244)	900 (274)	1000 (305)
0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15
0.14	0.14	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20
0.23	0.25	0.26	0.28	0.29	0.30	0.32	0.33	0.34	0.36	0.37	0.39	0.40
0.32	0.35	0.38	0.40	0.42	0.43	0.45	0.46	0.49	0.51	0.54	0.55	0.57
0.47	0.53	0.58	0.62	0.66	0.70	0.73	0.76	0.82	0.87	0.92	0.96	1.00
0.66	0.76	0.85	0.93	1.00	1.07	1.13	1.20	1.31	1.42	1.51	1.60	1.69
0.82	0.95	1.06	1.16	1.26	1.34	1.43	1.50	1.65	1.78	1.90	2.02	2.13
1.01	1.17	1.30	1.43	1.54	1.65	1.75	1.84	2.02	2.18	2.33	2.47	2.61
1.21	1.40	1.57	1.72	1.85	1.98	2.10	2.22	2.43	2.62	2.80	2.97	3.13
1.44	1.66	1.85	2.03	2.19	2.35	2.49	2.62	2.87	3.10	3.32	3.52	3.71
1.68	1.94	2.16	2.37	2.56	2.74	2.90	3.06	3.35	3.62	3.87	4.11	4.33
1.93	2.23	2.50	2.74	2.95	3.16	3.35	3.53	3.87	4.18	4.47	4.74	4.99
2.35	2.72	3.04	3.33	3.59	3.84	4.08	4.30	4.71	5.08	5.43	5.76	6.08
3.13	3.62	4.05	4.43	4.79	5.12	5.43	5.72	6.27	6.77	7.24	7.68	8.09
3.72	4.30	4.81	5.27	5.69	6.08	6.45	6.80	7.45	8.04	8.60	9.12	9.62
5.00	5.77	6.45	7.06	7.63	8.16	8.65	9.12	9.99	10.79	11.54	12.24	12.90
5.84	6.75	7.54	8.26	8.92	9.54	10.12	10.67	11.68	12.62	13.49	14.31	15.08
7.21	8.33	9.31	10.20	11.02	11.78	12.49	13.17	14.43	15.58	16.66	17.67	18.63
9.74	11.25	12.57	13.77	14.88	15.91	16.87	17.78	19.48	21.04	22.49	23.86	25.15
11.55	13.34	14.91	16.33	17.64	18.86	20.00	21.09	23.10	24.95	26.67	28.29	29.82
12.52	14.46	16.16	17.70	19.12	20.44	21.68	22.86	25.04	27.04	28.91	30.67	32.32
15.50	17.89	20.01	21.91	23.67	25.30	26.84	28.29	30.99	33.48	35.79	37.96	40.01
18.62	21.50	24.03	26.33	28.44	30.40	32.24	33.99	37.23	40.22	42.99	45.60	48.07
21.83	25.21	28.18	30.87	33.34	35.65	37.81	39.85	43.66	47.16	50.41	53.47	56.36
25.09	28.97	32.39	35.48	38.32	40.97	43.45	45.80	50.18	54.20	57.94	61.45	64.78
26.40	30.48	34.08	37.33	40.32	43.10	45.72	48.19	52.79	57.02	60.96	64.66	68.15
28.35	32.74	36.60	40.10	43.31	46.30	49.11	51.77	56.71	61.25	65.48	69.45	73.21
32.68	37.74	42.19	46.22	49.92	53.37	56.60	59.66	65.36	70.60	75.47	80.05	84.38
34.77	40.15	44.89	49.17	53.11	56.78	60.23	63.48	69.54	75.12	80.30	85.17	89.78
37.87	43.73	48.89	53.56	57.85	61.85	65.60	69.15	75.75	81.82	87.46	92.77	97.79
40.88	47.20	52.77	57.81	62.44	66.75	70.80	74.63	81.76	88.31	94.41	100.13	105.55
43.78	50.55	56.51	61.91	66.87	71.48	75.82	79.92	87.55	94.57	101.09	107.23	113.03
46.55	53.76	60.10	65.84	71.11	76.02	80.63	84.99	93.11	100.57	107.51	114.03	120.20
49.21	56.82	63.53	69.59	75.17	80.36	85.23	89.84	98.42	106.30	113.64	120.54	127.06
51.74	59.74	66.79	73.17	79.03	84.49	89.61	94.46	103.48	111.77	119.48	126.73	133.59

APPENDIX C:
Supplemental Technical Data

Soil Map—Marin County, California
(Bill's Trail Soil Map)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:13,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marin County, California
Survey Area Data: Version 5, Dec 10, 2007

Date(s) aerial images were photographed: 6/12/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Marin County, California (CA041)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
120	DIPSEA-BARNABE VERY GRAVELLY LOAMS, 50 TO 75 PERCENT SLOPES	525.0	58.3%
125	FELTON VARIANT-SOULAJULE COMPLEX, 30 TO 50 PERCENT SLOPES	14.2	1.6%
126	FELTON VARIANT-SOULAJULE COMPLEX, 50 TO 75 PERCENT SLOPES	97.3	10.8%
163	SAURIN-BONNYDOON COMPLEX, 30 TO 50 PERCENT SLOPES	55.1	6.1%
164	SAURIN-BONNYDOON COMPLEX, 50 TO 75 PERCENT SLOPES	92.9	10.3%
179	TOCALOMA-MCMULLIN COMPLEX, 30 TO 50 PERCENT SLOPES	0.8	0.1%
185	TOCALOMA-SAURIN ASSOCIATION, EXTREMELY STEEP	115.0	12.8%
Totals for Area of Interest		900.3	100.0%

Marin County, California

120—DIPSEA-BARNABE VERY GRAVELLY LOAMS, 50 TO 75 PERCENT SLOPES

Map Unit Setting

Elevation: 500 to 1,700 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 275 to 365 days

Map Unit Composition

Dipsea and similar soils: 50 percent
Barnabe and similar soils: 20 percent
Minor components: 30 percent

Description of Dipsea

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability (nonirrigated): 7e

Typical profile

0 to 8 inches: Very gravelly loam
8 to 25 inches: Very gravelly clay loam
25 to 48 inches: Very gravelly loam
48 to 52 inches: Weathered bedrock

Description of Barnabe

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave

Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and/or chert

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability (nonirrigated): 7e

Typical profile

0 to 8 inches: Very gravelly loam
8 to 16 inches: Very gravelly loam
16 to 20 inches: Bedrock

Minor Components

Centissima
Percent of map unit: 5 percent

Maymen
Percent of map unit: 5 percent

Maymen variant
Percent of map unit: 5 percent

Tocaloma
Percent of map unit: 5 percent

Unnamed shallow
Percent of map unit: 3 percent

Unnamed deep
Percent of map unit: 3 percent

Unnamed mod. deep
Percent of map unit: 2 percent

Henneke
Percent of map unit: 2 percent

Data Source Information

Soil Survey Area: Marin County, California
Survey Area Data: Version 5, Dec 10, 2007

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

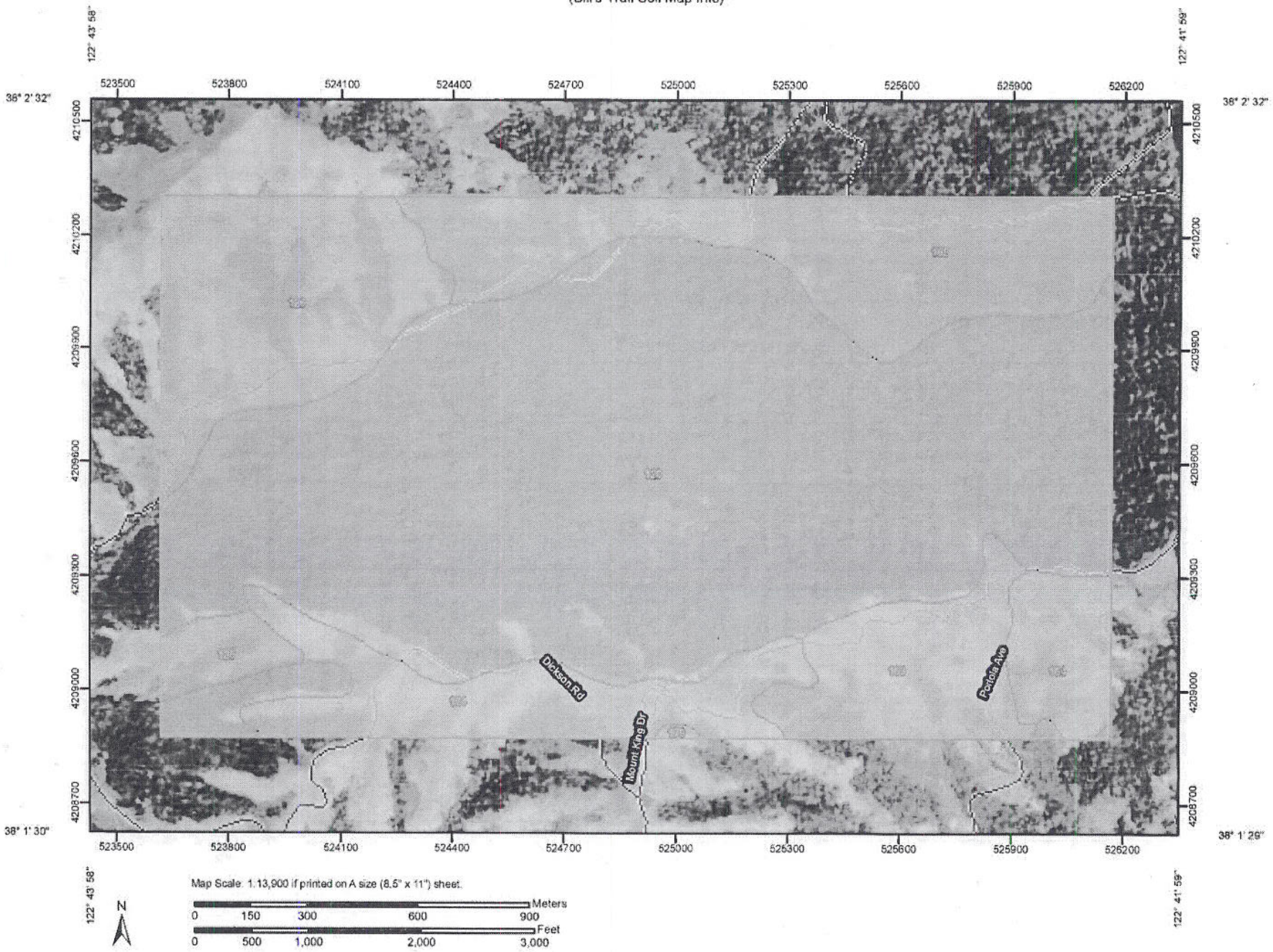
Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
109*:											
McMullin Variant	0-14	Gravelly sandy clay loam.	SC, GC	A-6	0-5	55-80	50-75	45-65	35-50	30-40	10-20
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
110*, 111*, 112*:											
Centissima	0-15	Loam	ML, CL-ML	A-4	0	95-100	75-90	60-80	50-65	20-30	NP-10
	15-22	Loam, gravelly loam.	CL-ML, SM-SC, GM-GC	A-4	0	70-95	60-90	50-80	40-65	25-30	5-10
	22-33	Very gravelly clay loam, gravelly clay loam, gravelly loam.	GC, SC	A-2	0	45-80	35-70	20-45	20-35	30-40	10-20
	33	Weathered bedrock	---	---	---	---	---	---	---	---	---
Barnabe	0-8	Very gravelly loam.	GM-GC, GM	A-2	0	45-55	35-50	30-45	25-30	25-35	5-10
	8-16	Very gravelly loam.	GM-GC, GM	A-2	0	45-55	35-50	30-45	25-30	25-35	5-10
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
113	0-28	Clay	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
Clear Lake	28-60	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
114	0-10	Gravelly sandy loam.	SM, GM	A-2, A-4	0-10	55-85	50-75	35-60	25-40	20-30	NP-5
Cortina	10-44	Stratified very gravelly loamy sand to very gravelly loam.	GM, GP-GM	A-1, A-2	0-10	30-60	25-55	15-40	5-35	20-30	NP-5
	44-60	Stratified very gravelly sand to very gravelly loamy sand.	GP, SP, SP-SM, GP-GM	A-1	0-10	30-60	25-55	15-45	0-10	---	NP
115*, 116*, 117*, 118*:											
Cronkhite	0-15	Loam	ML	A-4	0	100	95-100	85-95	60-75	25-35	NP-10
	15-26	Clay loam	CL	A-6	0	100	95-100	90-100	70-80	30-40	10-20
	26-45	Clay, clay loam	CL, CH	A-7	0	100	95-100	90-100	70-95	40-55	15-30
	45-55	Weathered bedrock	---	---	---	---	---	---	---	---	---
Barnabe	0-8	Very gravelly loam.	GM-GC, GM	A-2	0	45-55	35-50	30-45	25-30	25-35	5-10
	8-16	Very gravelly loam.	GM-GC, GM	A-2	0	45-55	35-50	30-45	25-30	25-35	5-10
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
119*, 120*:											
Dipsea	0-8	Very gravelly loam.	GM, GM-GC	A-2	0	50-60	30-50	25-50	20-35	25-35	5-10
	8-25	Very gravelly clay loam, very gravelly loam.	GC	A-2	0	50-60	30-50	25-50	25-35	30-40	10-20
	25-48	Very gravelly loam.	GM, GM-GC	A-2	0	50-60	30-50	25-50	25-35	25-35	5-10
	48	Weathered bedrock	---	---	---	---	---	---	---	---	---
Barnabe	0-8	Very gravelly loam.	GM-GC, GM	A-2	0	45-55	35-50	30-45	25-30	25-35	5-10
	8-16	Very gravelly loam.	GM-GC, GM	A-2	0	45-55	35-50	30-45	25-30	25-35	5-10
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

≤ Fine sands

≤ Silts, clays

K Factor, Whole Soil—Marin County, California
(Bill's Trail Soil Map Info)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:13,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marin County, California
Survey Area Data: Version 5, Dec 10, 2007

Date(s) aerial images were photographed: 6/12/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

K Factor, Whole Soil

K Factor, Whole Soil— Summary by Map Unit — Marin County, California				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
120	DIPSEA-BARNABE VERY GRAVELLY LOAMS, 50 TO 75 PERCENT SLOPES	.10	525.0	58.3%
125	FELTON VARIANT-SOULAJULE COMPLEX, 30 TO 50 PERCENT SLOPES	.37	14.2	1.6%
126	FELTON VARIANT-SOULAJULE COMPLEX, 50 TO 75 PERCENT SLOPES	.37	97.3	10.8%
163	SAURIN-BONNYDOON COMPLEX, 30 TO 50 PERCENT SLOPES	.32	55.1	6.1%
164	SAURIN-BONNYDOON COMPLEX, 50 TO 75 PERCENT SLOPES	.32	92.9	10.3%
179	TOCALOMA-MCMULLIN COMPLEX, 30 TO 50 PERCENT SLOPES	.32	0.8	0.1%
185	TOCALOMA-SAURIN ASSOCIATION, EXTREMELY STEEP	.32	115.0	12.8%
Totals for Area of Interest			900.3	100.0%

Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Layer Options: Surface Layer